THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., NOVEMBER 26, 1891.

THE WEEK IN IRON CIRCLES.

General Features.

A sweeping view of the iron trade throughout the world reveals a generally unsatisfactory condition at the present writing. Summarized, the reports from various countries are as follows: In Great Britain the great decline in exports during October, the decided fall in the London metal market, the financial troubles in Germany, and, finally, the continued deadlock in Scotch pig iron warrants, have all combined to depress the iron market still more than at previous reports. The Belgian iron market is still in a depressed condition, and it is very difficult to obtain orders without making concessions upon official prices. The French market is in an uncertain state. While in some districts there is rather a weakening tendency, its tone in others is pretty firm. The German iron market continues very quiet, business in all branches being restricted. Prices have a downward tendency, and the general tone is one of depression. In American raw material markets, East, West and South, by common consent, sellers' and buyers' attention has been turned more to old business than to new. Nearly all the furnaces have large orders on their books, and in the South there has been trouble on all hands in getting cars to forward the freight. Buyers seem to think the temporary lull is an indication of weakness of the market, and that when buying is again resumed they will be in position to knock off some of the advance that had been established in October. One Southern furnace company has failed, but its situation was exceptional in many respects, and cannot be taken as significant of any weakness among Southern producers generally. The fact is that most of the companies, through rigid economies, increased output and improved quality of iron, are actually strengthening their position even during the present trying times. Our Detroit correspondent notes the fact that, while the demand for material does not seem to change to any degree, neither does the firmness, and with the long-looked-for increase in the latter, the constant additions to the stocks on hand at furnaces, and the comparatively light demands, make this delay seem certainly dangerous. That prices cannot be forced a notch lower is generally conceded by both buyers and sellers, but notwithstanding this and also a much easier money market, that buyers do not make larger purchases and feel safe to anticipate their requirements further ahead is very noticeable, and not very comforting to the sellers. Lake Superior charcoal at the present time is absolutely stagnant for orders of any magnitude. This is attributed, largely, to the closing of lake navigation, however, and except for very active markets in years past, is nothing more than a repetition, rather decidedly emphasized. The situation in the Chicago district remains practically unchanged since last report. There is the usual run of carload orders, with a few 100-ton lots. What little activity is shown is confined to coke metal, Lake Superior charcoal being in no great demand. Prices remain unchanged. The short car supply in the South continues to interfere with prompt shipments, furnaces in many cases having orders from 30 to 60 days overdue. Business at St. Louis during the week has been confined chiefly to small orders for early delivery. The increased activity of several car works is considered a favorable indication, and it is hoped that the present quiet period will not be long continued. Dullness still continues to be the principal feature of the Buffalo market. As the year draws to a close, consumption gradually decreases. With the present heavy production, January, 1892, will probably record the heaviest stock of pig iron on hand ever before known. Considering the outlook, prices are fairly well maintained, but a round lot of allmost any iron for early delivery, could probably now be purchased at an exceedingly favorable figure for the buyer. In steel rails, very little is doing at present, but it is estimated that in the past two weeks the Western mills have closed for about 175,000 tons, Winter and Spring delivery, the quantity stated not including the recent 70,000-ton order given out by the Pennsylvania Railroad Company. October deliveries footed up of iron ore 100,030 gross tons.

The Local Situation.

The season is so very near its close that, barring a few odd cargoes from Escanaba, there is nothing more to do than to prepare for the closing of accounts. The ore producers, holding the market well in hand, are resting quietly, all the conditions at this time being in their favor. The future of the vessel business is not nearly as secure, however, judging from the activity displayed in boat-building. There are now in process of construction, and under contract for readiness at or near the opening of navigation, fifteen big boats, two of them designed to carry thirty-four hundred gross tons. In other words, an average of twenty trips will thus increase the lake tonnage by some eight hundred thousand tons, which must be met somewhere, by the vessels now in commission. The trend of the situation is altogether in the direction of reserving the big carriers, from the start, for the use of their owners who, in most instances, are either ore producers or sales agents, so that this combination is bound, in time, greatly to reduce, if not altogether to wipe out, wild boats. Moreover, the economy of running bigger boats has become so apparent that the smaller vessels are either going into the lumber business, or will be compelled to lay off altogether, awaiting any advance in the market that will enable them to go in for a share in the general business. The ore business for the year has been very good, all things considered. Besides the season's output of more than six and a-half million tons, the market has consumed about two million tons left over from last year, so that the actual consumption of the raw material exceeded that of last year. The reduced output of the season now about to come to a close has assisted in the clearing up of the docks, and if the shipments to the furnaces in the interior keep up as they are now going on, Spring will find the ore docks freer from encumbrance than ever before. While the ore men have, therefore, every reason to look forward to a very good business next year, the same cannot be said of other branches of the business. Pig iron seems to be as little in demand as at any time this Fall, and the prices are simply suicidal, wherever any sales, indeed, are reported. Bessemer iron is the lowest on the list, in spite of the fact that the railways have begun to place heavy orders, and no one knows just where this slump is going to stop. Sixty days ago there were all the signs of a general advance, but even this temporary feeling of firmness has completely petered out, and no one seems to have a good word for pig iron. Yet the stocks are not increasing, most of the product made in excess of old orders going in small quantities to spot buyers who have either confidence enough to hold their purchases, and who buy with a speculative end in view, or else who cover their actual wants in this way rather than give a large order for future delivery which might have a tendency to drive up the price. Nevertheless, the influence of the large railway orders must make itself felt sooner or later, and the work necessary for the required replacements is so very large that the conditions of the iron market during '92 ought to be very much improved. In the meantime, manufactured iron is as low as ever, and the demand, except for smaller numbers of black sheets, is next to nothing. Metals, which have been fairly strong during the season, are showing decided weakness at this time, and the tendency is still in a downward direction, while hardware is very strong, with a flourishing business in all the lines.

THE IRON ORE SEASON OF 1891.

The season of navigation is so nearly at its end that, although the total for the year is as yet only approximately correct, the figures to come cannot substantially affect the result. The heavy grain shipments now going forward have reduced the ore fleet to such an extent that the few remaining days of navigation will cut no figure, and in consequence, the result of the year may well be summed up, even though navigation is not yet at an end. We, therefore, place the total product of Lake Superior mines for 1891 at 6,500,000 tons, or very near that figure, as compared with 9,000,000 tons in 1890.

The conditions that surround the market are as radically different from those that obtained a year ago as they can well be. Last year the ore men were confronted with an overplus of ore and a lack of demand, while this year there is a scarcity of ore, and a good demand. This vast difference in condition may be reduced, to be sure, when the two years are considered in common, for by that process it will be found that the division, made upon that plan, will about equal 1889. Still, the market is apt to be influenced by temporary conditions more than by the philosophy of trade, so that no amount of comparisons will affect the actual surroundings of the market; and while there is no lack of reasons as to why a certain thing should, or should not be, the market reckons mainly with the things that have a concrete existence.

Hence it comes that while the overplus of last year and the underproduction of this, ought to combine pretty well in rounding out both years, nothing is further from the facts in the case. The people who, in the Fall of '89, by their wholly unreasonable scramble for ore forced up the price and, in consequence, became losers, simply charged the difference in the ore price off their books. To be sure, they were not very anxious to buy this year, but the great number of such so affected the market as to cause a very serious shrinkage in production, and which brought about the other extreme, a sharp demand for ore.

With these conditions prevailing at the close of the season, it seems to be accepted by producers not less than by consumers that whatever sales of '92 ore are first made, will be on a basis of '90 prices, which means a substantial improvement over '91; and while the season now about to close could hardly be called a profitable one to the ore interests, they made some small gains, with the hope of better luck next year.

EFFICIENCY OF LABOR IN IRON MANUFACTURE.

That portion of the annual report of Labor Commissioner C. D. Wright, which relates to the relative efficiency of labor in iron and steel manufacture, is very interesting and instructive. The method of determining the efficiency of labor is arrived at in this way: The wages of the entire force for a single week is first computed, and is then divided by the number of hours of work done, giving the average wages per workman per hour; this is then divided by the labor cost per ton, the quotient, of course, being the desired result—average tons of product per man per hour.

From the elaborate tables printed it appears that, in pig iron, in the Northern district of the United States forty-three of the forty-five establishments reporting have an efficiency of .08 of a ton or more, one ranging as high as .16 and under .17, thirty-four being concentrated in the four groups that begin with .08 and end with .12; while in the Southern district of the United States fourteen of the twenty-one have an efficiency under .08, and of the seven above that figure five are under .10. In the Northern district for those of .08 and above, the average earnings per man per hour range from 14.1 cents to 18.5, increasing quite generally with the increase of efficiency, while those below .08 have earnings from 11.1 cents to 12.8. In the Southern district the tendency of efficiency and earnings to move together is not so marked, though the two most efficient have earnings above the average. In Great Britain three establishments are given, two of which have a high efficiency, both being between .12 and .14 tons and accompanied by earnings of 9 and 10 cents, while the remaining one, with an efficiency between .07 and .08 tons, has earnings of but 5.8 cents. Five establishments for the continent of Europe have an efficiency rather lower than the Northern district of the United States, agreeing, perhaps, more nearly with the Southern. No connection between efficiency and earnings is traceable in them.

In muck bar the United States, Great Britain and the continent of Europe are about on a par as to efficiency, though the number of establishments from the foreign countries is too few for an emphatic conclusion.

In steel ingots five of the seven United States establishments have an efficiency between .10 and .13 tons, three being in the group of .12 and under .13, the same position as is occupied by one of the two for Great Britain and one of the three for the continent of Europe. The remaining three for the foreign countries stand very low in the scale, being under .07 tons, a position occupied by only one of the seven United States establishments. High earnings are here also generally found with high efficiency.

For steel rails the United States is represented by two concerns, the continent of Europe by five, and Great Britain by one. The difference in efficiency here is very marked. The two for the United States have an efficiency equal to between .12 and .13 tons of product per man per hour, and the five for the continent of Europe all fall under .06 tons, ranging down even under .02 tons, while the single establishment for Great Britain shows an efficiency of between .08 and .09 of a ton.

The manufacturer and the student of economy will find in these facts much food for study, and, so far as the American manufacturer and workman are concerned, much reason for congratulation.

TRANSPORTATION IN THE CENTRAL WEST.

The census railway statistics, which have just come from the press, group the railways of the United States geographically. The data for what may be called the Central West embrace the States of Ohio and Indiana, the southern peninsula of Michigan, and that portion of the States of Pennsylvania and New York lying west of the lines drawn from Pittsburgh, Pa. to Buffalo, N. Y., *via* Salamanca, N. Y. A summary of several items of interest, pertaining to the transportation business of this portion of territory, is herewith presented:

Items.	1889.	1880.
Number of passengers carried	55,456,445	27,749,647
Number of passengers carried 1 mile	1,805,952,002	1,043,233,578
Tons of freight moved	122,873,217	60,256,948
Tons of freight moved 1 mile	14,713,530,106	7,851,965,676
Earnings from passenger service	$46,757,662.91	$28,291,908.74
Earnings from freight service	$103,751,821.76	$73,452,548.55
Total earnings and income	$154,298,880.66	$104,467,129.19
Total expenditures	$149,172,772.73	$96,436,362.54
Length in miles of all lines operated	22,241.35	14,624.86
Total number of employes	107,542	73,425
Number of cars in passenger service	3,501	2,420
Number of cars in freight service	164,174	83,283
Number of locomotives	4,645	3,223
Number of stations on all lines	5,119	3,741
Receipts per mile per passenger (cents)	2.090	2.167
Receipts per mile per ton of freight (cents)	0.684	0.892

Taking groups I, II and III, which may be said to cover, respectively, New England, the Middle States and the Central West. Group II stands first, group III second and group I a very bad third. The showing for the great central section is certainly very flattering, whether taken by itself or placed in comparison with the figures of 1880. The tonage of freight moved in 1889 in this section amounted to 122,873,217 tons, in comparison with 60,256,948 tons moved in 1880, an increase of over 100 per cent. The increase in the Middle States was 66 per cent.

ECONOMIC CONDITIONS OF AMERICAN IRON-WORKERS.

Statistics of the incomes, expenses and savings, or otherwise, of 2,490 families in the United States are given by the Commissioner of Labor in his annual report. Of the above, 762 families are engaged in the pig iron industry, 623 in bar iron, 183 in steel, 508 in bituminous coal, 219 in coke, and 165 in iron ore. Of 770 families investigated in Europe, 76 are engaged in the pig iron industry, 251 in bar iron, 201 in steel, 194 in bituminous coal, 29 in coke, and 19 in iron ore.

From the data given, it appears that the largest average income in the United States is by bar iron families, it being $784.11. The smallest income is for iron ore families, it being $401.65. In Europe the highest income is for families engaged in the steel industry, where it is $500.10. One would naturally have expected that in the United States the average income of families engaged in the steel industry would have been the largest, instead of those in the bar iron, or any other of the industries considered; but for several years the new processes introduced in the manufacture of steel in this country have enabled the producers to employ a lower grade of help, so that bar iron with its skilled workmen now leads the iron industries. In Europe these processes have not been so thoroughly developed in the steel manufacture, and so a high grade of skill is found there.

Incomes vary widely even in the United States. For instance, in the pig iron industry, the average family is 5.6, with an average income of $499.05, or an average for each individual in each family of $88.48; in Illinois the income rises to $723.69 per family, or $168.30 per individual; in Ohio, $586.39 per family; in New York, $556.99; in Pennsylvania, $625.59; in Tennessee, $546.61; in Virginia, $450.29, and in West Virginia, $696.67. For Belgium the income per family is $374.53, while in Great Britain it is $456.86.

For the 2,490 American families, 540 own homes, and the aver-

age rental for others is $15.23 per individual; while for Europe 31 families out of 770 own their houses, and the average expenditure for rent is $7.91 per individual, or half what it is in the United States. The average expenditure for food in Europe is $41.80 per individual, as against $48.60 in the United States. The total expenditure for all purposes per individual in Europe is $82.25, as against $110.88 in the United States, while the average income per individual for the European families is $88.47 as against $124.11 in the United States. The average expenditure for intoxicating liquors for all the families giving information in the United States was $19.60, and in Europe, $23.17. The average expenses for books and newspapers are: In the United States, $5.70; in Belgium, $2.51; in Great Britain, $5.10.

OHIO AS AN IRON ORE PRODUCER.

From 1850 to 1860 Ohio stood second in the ranks of iron ore producing States, with over 1,000,000 tons production. In the census of 1870 she held third place; in 1880 she occupied fifth place, and in 1889 (the year for which the latest census figures were taken), she fell to eleventh, being ranked with six other States whose aggregate production ranged from 100,000 to 500,000 tons. Had the census figures covered 1890 as they should have done for better purposes of comparison, Ohio's rank would have been still lower, possibly thirteenth, since her production decreased from 250,409 tons in 1889 to 169,088 tons in 1890, a loss of 81,321 tons. The above figures are from the annual report of the Hon. Robert M. Haseltine, Chief Inspector of Mines in Ohio (just issued) and can be strictly relied on. The above aggregates were divided as follows: Black band, 1889, 70,398 tons; 1890, 41,848 tons; hematite, 1889, 180,011 tons; 1890, 127,240 tons.

Of the eleven counties reported as producing iron ore in 1889, five dropped out of the ranks entirely in 1890, and three produced quantities so small as to be hardly worth consideration.

The most notable loss is in Mahoning, Trumbull and Tuscarawas counties, which were at one time underlaid with large deposits of black band ore, which was mined in large quanties, roasted near the mines, and shipped to the local blast furnaces where it was mixed with Lake Superior ores, producing the celebrated American Scotch pig. The quantity of this ore mined has gradually fallen off during the past two years, Mahoning county producing only 6,114 tons in 1890 and Tuscarawas county 25,734 tons, a total of 41,848 tons, a falling off from the previous year of 28,550 tons.

SPEAKING of long iron and steel shavings, we record as a matter of interest, though not by any means as capping the climax, the fact that at the Wagner Palace Car Works a bar of soft steel was recently being turned up, and during the process a shaving 81 feet, 1½ inches long over all was formed. It was, of course, curled up as in the case with such shavings, and could it be straightened out in a straight line it is probable that the exact length of the shaving would be more than double the figures above given.

"NOBODY believes that the cutlery makers of Sheffield, the cotton weavers of Manchester, the woolen manufacturers of Leeds, would be holding meetings and passing resolutions denouncing the protective tariff of the United States if their goods could be sold for the same price as under free trade," says Mr. A. M. Garland, Secretary of the Illinois Branch of the American Protective League; and so say we all.

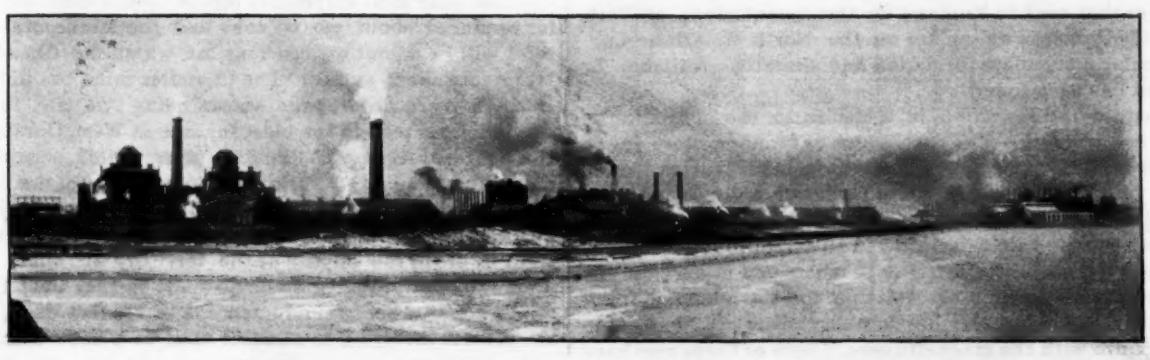
COLONEL CARROLL D. WRIGHT, Labor Commissioner, Washington, D. C., is entitled to greatest credit for his painstaking research into the cost of production, efficiency of labor and cost of living, in leading industries. His Sixth Annual Report is a marvel of statistical study.

THE experiment of making coke pig iron at Duluth will be watched with interest; but our friend, the Duluth *Herald*, can hardly expect with reason that $3.24 for down freight on ore and 10 cents for up freight on coal will represent the normal condition of things.

THE *Bulletin* of the American Iron and Steel Association is of the opinion that the recent elections resulted in a strong endorsement of the policy of Protection.

THE ILLINOIS STEEL COMPANY.

The Illinois Steel Co. was organized and incorporated under the laws of that State, May 1, 1889. This immense corporation was formed through the consolidation of three of the largest manufacturing companies of the West, namely: The North Chicago Rolling Mill Co., Joliet Steel Co. and The Union Steel Co. The Illinois Steel Co. has an authorized capital of $50,000,000 and includes five manufacturing plants, rich coal and ore lands, coke ovens, etc. The plants of the company are known as the North Chicago Works, situated in the northwestern section of the city on the North branch of the Chicago River. The South Chicago Works, located on the shore of Lake Michigan, about twelve miles from the centre of the city; The Milwaukee Works, at Bay View, an environ of Milwaukee, situated on the shore of Lake Michigan; The Union Works, located in the southwestern part of Chicago on the South branch of the river, and The Joliet Works, situated at Joliet, Ill., about forty miles south of Chicago. Of these plants the South Chicago Works is the largest and newest, having recently been remodeled and enlarged, and consist of eight blast furnaces, a Bessemer plant with three vessels, blooming mill, rail train, an open hearth steel plant and plate mill about to be erected, harbor docks, etc. The ground surface covered by these works is over two hundred acres, and the entire plant is thoroughly provided with every appointment that could be desired, while its shipping and transportation facilities are unexcelled, having both water and railroad connection. The North Chicago Works comprise two blast furnaces, a Bessemer plant, a blooming mill and a rail and structural steel mill with finishing shops. The products of these works consist of steel rails, beams and slabs. The Milwaukee Works is the only plant of the Illinois Steel Co. devoted to the production of manufactured iron, and its chief products consist of various kinds of bar iron and steel, fish-plates, light rails, nails, etc. The Company's Union Works comprise four blast furnaces, converting works and rail mill, and the product consists entirely of rails; while the operation of the Joliet Works produces rails, billets, wire rods, angle bars, girder rails, etc. These works are comprised of three blast furnaces, a Bessemer plant, rail and billet mills, wire rod mill, foundry, air furnace, etc. A noteworthy feature of these works consists in the provision of a large and handsome club house with swimming bath, gymnasium, etc., for the use and pleasure of the employes. The five plants of the Illinois Steel Co. occupy an approximated area of five hundred acres of ground and the coal lands consist of 4,500 acres in the Connellsville district, on which there are 1,150 coke ovens, besides other lands in West Virginia. Between ten and eleven thousand men are employed in the service of the company and over $6,000,000 are annually paid out in wages. The company have sixty miles of standard and seven miles of narrow gauge railroad in the yards of the various works, while the transportation of products and material requires the use of 500 cars and forty-two locomotives, exclusive of seventeen narrow gauge engines required in hauling special trucks. The company owns 1,500 cars which are used in the coke trade, besides 150 in ore traffic. The affairs of the Illinois Steel Co. are officered by gentlemen, celebrated throughout the financial, commercial and manufacturing circles of the world, and this is indeed a corporation of whose magnitude every American should feel proud. The company owns nineteen blast furnaces and has an annual productive capacity of over one million tons of pig and spiegel iron. When rolling rails at its South Union and Joliet plants simultaneously it can produce 75,000 tons per month. Among the representative Chicago men who are stockholders and directors are to be found Marshall Field, H. H. Porter, Norman Williams and others equally well known.



THE ILLINOIS STEEL COMPANY.

Products of One Ton of Coal.

From a single ton of ordinary gas coal may be produced 1,500 pounds of coke, 20 gallons of ammonia water and 140 pounds of coal tar. By destructive distillation the coal tar will yield 69.6 pounds of pitch, 17 pounds of creosote, 14 pounds of heavy oils, 9.5 pounds of naphtha yellow, 6.3 pounds of naphtaline, 4.75 pounds naphthol, 2 25 pound alazarin, 2 4 pounds solvent naphtha, 1.5 pounds phenol, 1 2 pounds aurine, 1.1 pounds benzine, 1.1 pounds analine, 0.77 of a pound toluidine, 0.46 of a pound anthracine and 0.9 of a pound of toluene. From the latter is obtained the substance known as saccharine, which is 230 times as sweet as the best cane sugar.

IRON ORE.

Manganese and Iron Ores of Indian Territory.

A correspondent of the *Bulletin* of the American Iron & Steel Association writes as follows: I take pleasure in giving you herewith a short description of the manganese belt of Indian Territory. This belt lies about 15 miles west of the town of Lehigh, in Indian Territory. The manganese is found apparently in the lower silurian limestone, or, rather, lies on the lower silurian and has been covered with the middle silurian limestones. I have been informed that the formation, mode of occurrence, and general characteristics of the belt are identical with the manganese beds of Cuba and Chili, and that our clay deposits or manganese ores imbedded in clay, are like similar deposits at Batesville, Ark. * * * *

An analysis of the black oxides in the clay deposits gave the following results: Manganese, 63 5 per cent.; iron, 1.23 per cent.; silica, 0.35 per cent.; and phosphorus, .023 per cent. A few analyses have also been made of these ores showing about 67¾ per cent. of manganese.

An average of analyses of seven samples of black oxide ores from the pockets shows the following results: Manganese, 51.53 per cent.; iron, 2.9 per cent.; silica, 0.89 per cent.; and phosphorus, 0.42 per cent.

From an average analysis of samples taken from several large stock piles the following results were obtained: Manganese, 42.95 per cent.; phosphorus, 050 per cent.; silica, 1.49 per cent.; iron, 5.95 per cent.; lime, 9.75 per cent.; moisture, 8.50 per cent.

The carbonates of manganese contain from 25 per cent. to 44 per cent. of manganese, and are equally low in phosphorus, silica and iron. The greatest quantity of sulphur yet recorded in any of the numerous analyses made is a "trace." This manganese-bearing belt or formation has been explored for 15 miles.

Under the manganese, in the lower silurian lime, is found a vein of limestone of the same kind as that used in England for the manufacture of Portland cement. This is, I believe, the only place on the North American Continent where this particular manganese formation and limestone suitable for making Portland cement has been found.

A very important feature of this section, in addition to the above, is the close proximity of coal and iron ore. The coal, which is found as close as one mile from the manganese belt, is the peacock coal of the lower carboniferous formation. It has been pronounced by experts to be exactly a duplicate of the peacock coal of Pennsylvania. The iron ore is found within one mile of the manganese belt, and is a hematite particularly low in all deleterious substances.

Magnetic iron ores are found at a distance of about ten miles from the manganese ores. These magnetic ores are suitable for the manufacture of Bessemer steel. The hematites being very low in phosphorus can be used to great advantage as a mixture with the magnetic ores. Both of these ores have been pronounced to be excellent, and far above the magnetic ores of the Lake Superior region, and the hematite ores of any region of the United States, the analyst who made the examination of the manganese, magnetic, and hematite ores having pronounced them to be "the best he had ever examined, without any exception whatever." Analyses of the magnetic and hematite ores, made for Gordon, Strobel & Laureau, of Philadelphia, gave the following results:

	Magnetic. Per cent.	Hematites. Per cent.
Silica	5.980	4.880
Iron	64 580	57.810
Manganese oxide	.110	.110
Sulphur	.029	.043
Phosphorus	.018	.061
Titanic acid	.400	.....

Spanish Iron Ores.

The British Vice-Consul, Mr. Pecket, writing from Garrucha, in the district of Malaga, observes that, with the exception of the lead mining and smelting industries, which are still on the decline, the general trade of this place has greatly increased, the exportation of iron ore alone being over 75,000 tons in excess of last year. His report states:

Iron mining all through the district is steadily on the increase. Large numbers of new mines have been opened out, and short lines of narrow gauge railway are being laid down to connect them with the cable road. The price of iron ore f. o. b. steamer in Garrucha is at present 7s. per ton for 50 per cent. of metallic iron contained in the ore, with a sliding scale of from 3d. to 4d. per unit in excess of this percentage. Freights run from 5s. per ton to 7s. per ton to the United Kindgom, and 7s. per ton to 9s. per ton to the United States. At the Herrerias, where several iron and manganese mines, together with a large number of silver ore ones, have been for a long time flooded by water which found its way into them from a neighboring river, extensive works are being carried on by an English company, who are employing powerful pumping machinery, and it is probable that this interesting mining district will soon resume its usual activity, and give employment to a large number of workmen who, were it not for this prospect and the iron mining in the Bedar Hills, would undoubtedly have to emigrate in search of work.—[London Money, Nov. 7.

The King of the Belgians Buys Northwestern Mineral Lands.

A dispatch from West Superior, Wis., dated November 30, says: At the office of Judge Roberts here, papers are being drawn this evening which will make King Leopold of Belgium owner of a large tract of country north of the international boundary, the deal for which your correspondent was informed yesterday had fallen through. A cable dispatch from Brussels to Count Vanburysill, containing a single word, was received this morning, and the deal was reopened. By 2 o'clock it was completed, and by it Mayor Martin Pattison made a contract running to Leopold of Belgium, direct in association with La Societa General Pour Fovorisen Se Lindustrie Nationale, of Brussels. The figures are not given, but the memoranda of contract are to the effect that the purchasers take Pattison and Bishoff's entire interest in ownership in 4,000 acres on the Atikokan range, agree to begin operations before January, 1892, to mine a certain quantity of ore per month and pay a royalty on it amounting to one-tenth of its value at the surface. A road is to be begun next year, and the contract calls for its completion before the close of 1893; the road to run daily trains from Port Arthur to the mines, a distance of about 70 miles. The transfer is one of the largest made in mining lands in the West.

Lake Superior Mining Notes.

A new find has been struck at the Sparta, north of Sunday Lake, one of the most promising options on the Gogebic range.—[Record, Ishpeming.

Geo. A. Korton has secured the north ½ of the southwest ¼ of section 4, 47-25, near Negaunee, from the Iron Cliffs Co. He shows some fine specimens of hard hematite, and thinks he has that which will develop into a good mine.—[Iron Ore, Ishpeming.

Geo. S. Shaw, the big lumberman of Cloquet, yesterday, consummated a deal with the Merritts of this city, which is indicative of the strong feeling in regard to lands on the Western Mesaba. He sold to them over 1,000 acres of land for $50,000, reserving the pine to himself. Mineral has been found on some of it and two forties are close to the rich Biwabik mine.—[Duluth Herald, Nov. 17.

The shipmets of ore from Two Harbors the past week, although small, were four times as large as a year ago, so that the shipments for the season are being greatly increased, says the Duluth *Herald*. The total movement up to date has been 22,445 tons greater than one year ago.

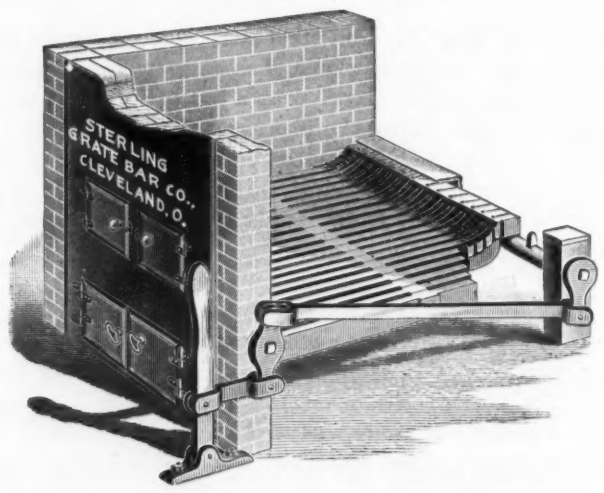
	1891	1890
Shipments for the week	16,314	3,728
Shipments for the season	892,242	869,932
In dock	10,174	10,039
Total	902,416	879,971

Last year total shipments for the season were 880,264, of which the Chandler produced about 330,000 tons and the Minnesota the rest. This year the total will be about 915,000 tons, of which the Chandler has 372.727 and the Minnesota about 540,000. The Chandler mine has finished shipping from Two Harbors, its record for the season being 372,727. In addition to this it has shipped 1,240 tons to the blast furnace at West Duluth.

At the Morgan pit, Republic mine, which occupies the extreme western end of the company's workings, the showing of ore is excellent, it being one of the finest bodies in the mine. Here they are now just entering lands lately purchased by them from the West Republic Iron Co., and have the evidence in sight to prove the buying of the territory was wise. There is a shaft located upon the later property some distance farther west than where mining operations are now being conducted. It is 150 feet deep, and full of water. It is the present intention to unwater this, to place a diamond drill in the bottom, and explore the surrounding ground, which by this means, can be readily and satisfactorily done. Everything points to the discovery of something important at this place. In the way of new work the company is also contemplating the starting of another shaft near the village, and at a point where they have recently been drilling. That this is being figured upon would indicate that something in the way of an ore body has been found to warrant the expenditure such a task would necessitate. There is yet considerable territory in the possession of the company to be looked over, and which will be given attention at proper time.—[Iron Ore, Ishpeming.

THE STERLING GRATE BAR.

A recent invention that is attracting a good deal of attention among steam users, is the Sterling grate bar, an illustration of which we show herewith. This is one of the most successful grate bars ever patented, having satisfactorily stood a most thorough and severe test, under the supervision of a practical man. A set of the Sterling bars were put in the Bohemian Brewing Co.'s plant, Cleveland, the first of last May, and after having been used continuously



until the first of November, were for the first time cleaned out, when it was found that they were in first-class condition, and not warped in the slightest degree. One of the special features of this grate bar is a succession of circular openings at either end of the bar through which the air can readily pass, thereby supplying oxygen to the flame in abundance. When burning fuel on ordinary bars, the loss of energy is very large owing to the insufficient supply of oxygen which causes imperfect or incomplete combustion.

By reference to the engraving it will be observed that the bars have a

slight dip or curve near their ends, the effect of which is, not only to form a bed for the fuel, but also to leave the bars at either end free and clear for the access of air from below. The furnace is thereby supplied at the rear and front with oxygen, which passes over and above the bed of fuel, mingles with the carbon, and insures more perfect combustion than would be possible if supplied merely from below and between the bars.

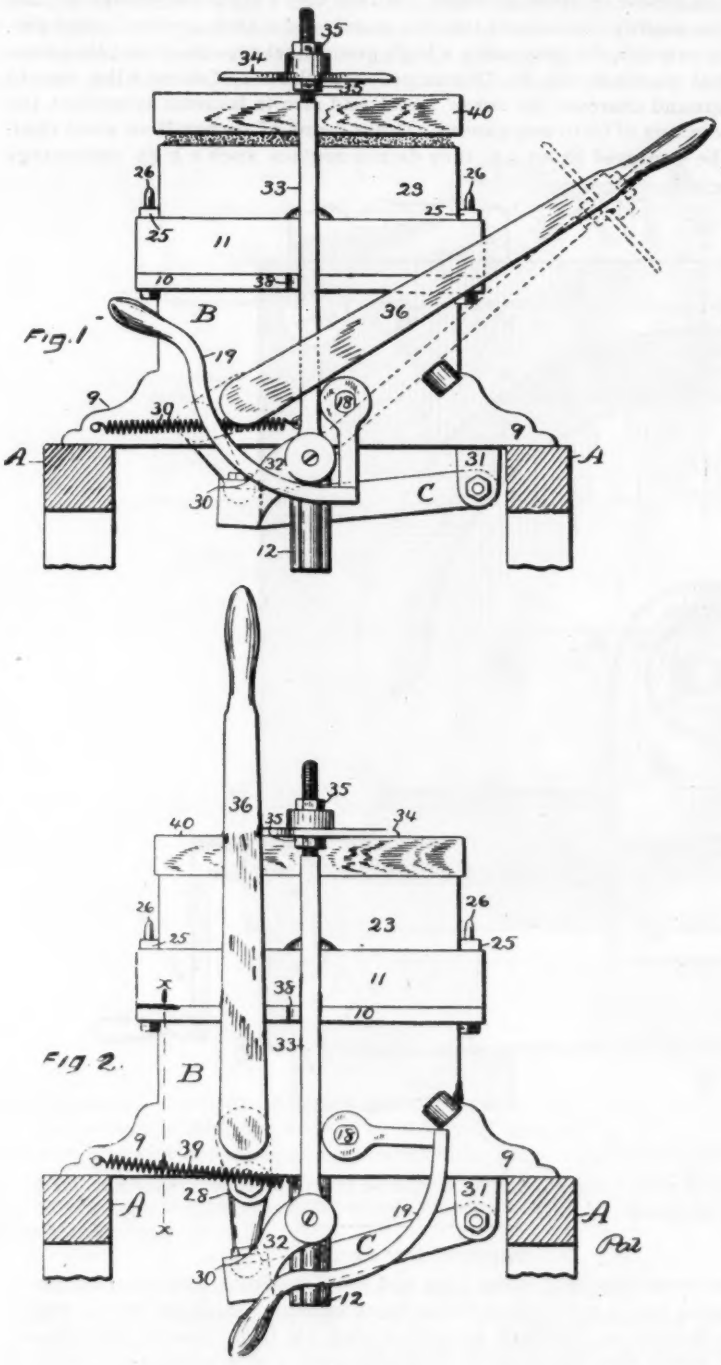
Another point in favor of the Sterling grate bar is the very convenient position of the lever connected with the shaking attachment. It is always in place and ready for use. It is not necessary to get down on your knees, in front of the ashpit doors, and lose time and temper in an endeavor to attach the lever. Firemen and stokers can testify to the annoyance occasioned by this necessity and will appreciate the present improvement. If it had no other superiority over other shaking grates, this one feature should turn the scale in its favor.

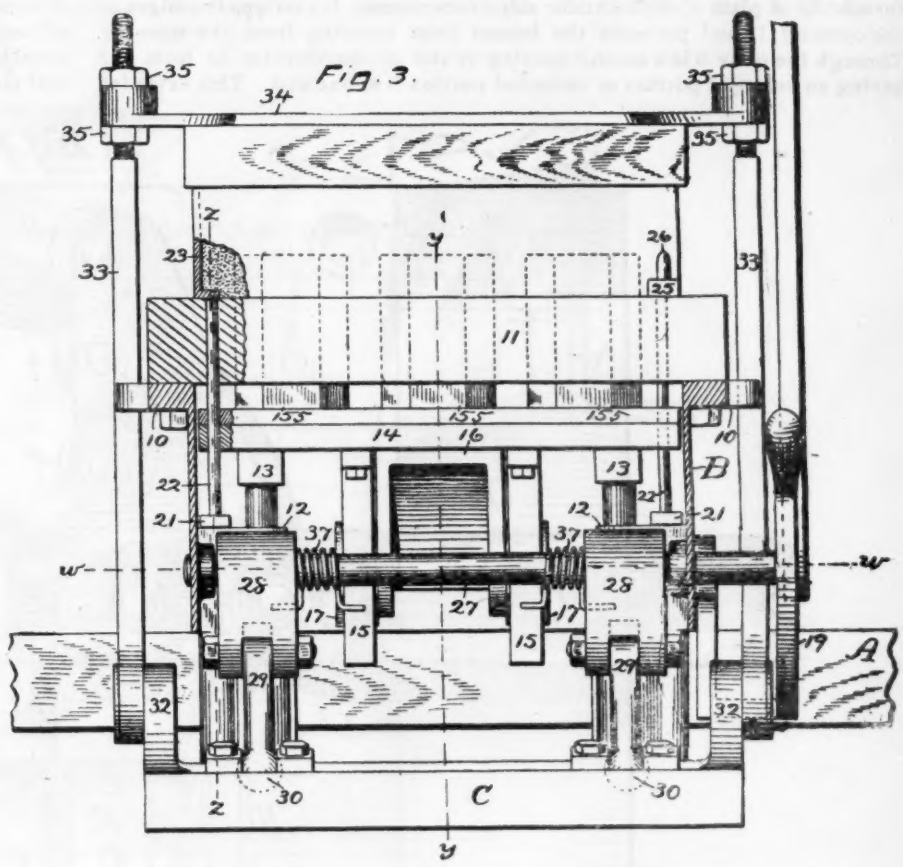
These bars are furnished either stationary or with shaking attachment, and if the stationary bar is put in originally, and subsequently a shaking attachment is desired, it can be added without any difficulty or inconvenience. The bars are made of the best grade of cast iron or annealed cast steel. The latter, although the highest priced, is the cheapest in the end, being practically indestructible. The bars have perfectly smooth faces, and can therefore be cleaned easily, and coal will not clinker so badly as on rough-faced grate-bars. They are also adapted for the burning of any kind of solid fuel.

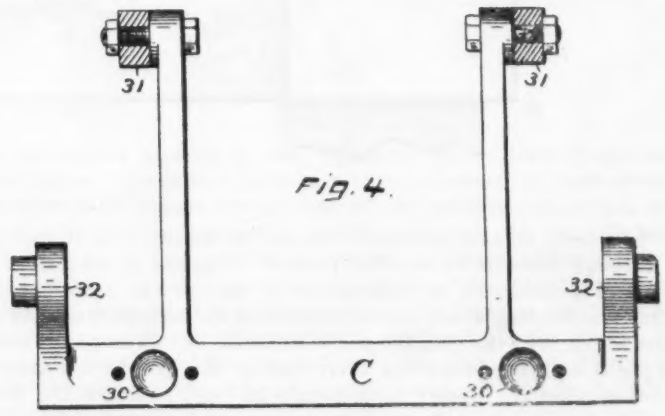
The bars are already in use by the Bohemian Brewing Co., the Union Dairy Co., Cleveland Brewing Co., Standard Oil Co., and Ohio Metallic Paint Co., all of whom are very much pleased with them. By adressing the manufacturers, The Sterling Grate Bar Co., Society for Savings Building, Cleveland, O., further particulars may be obtained.

IMPROVEMENTS IN MOLDING MACHINES.

P. O'Conner, of New Haven, Conn., has been granted a patent on an improvement in molding machines, of which Figs. 1, 2, 3 and 4 are illustrations. The machines are small, strong and durable, 20 inches long, 12 inches wide and 7 inches deep. The machine is so made that it can be set up on brackets or into a brass molder's bench. (Length of machine for snap flasks 24 inches.) For pressing the sand into the flask, a 30-inch lever is used. Single-handed, more pressure can be obtained than the combined strength of two men can get from the ordinary hand presser. Fig. 1 shows the flask in position filled with sand and pressing board and platen in position ready for pressing. It also shows the position of the pressing lever 36, the swinging bail C, the toggler arms 28 and 29, and ball-jointed sockets 30. Fig. 2 shows the position of the various parts when the sand is pressed into the flask. The great power of this presser can be readily understood. Figs. 1 and 2 also represent the positions of the pattern lever, 19, when used on turn-over draw-plate and sub-draw-plate molding machines. Fig. 1 shows position of pattern lever 19, when themachine is ready for molding. Fig. 2 shows its position when the patterns are withdrawn from the sand down through the stripping plate or mold board. The same movements lift the flask off the mold board, when the flask is then removed. Fig. 3 is an enlarged partial section on the line $x\ x$ of Fig. 2, the parts not sectioned being shown in front elevation. Fig. 4 is a plan view of the bail or swinging frame that draws down the presser-plate, the pivotal lugs of the main case or frame to which said bail is attached being shown in horizontal section. These machines are manufactured by the James Reynolds Manufacturing Co., of New Haven, Conn., of which the inventor is General Manager. They are also manufacturing sub-drawplate molding machines under O'Conner's patent, dated October 21, 1891, by which doorlocks, padlocks and like articles (having holes, studs or posts in them) can be successfully and rapidly molded, no draft being used or needed on the patterns, thereby saving considerable metal.







IMPROVEMENTS IN MOULDING MACHINES.

Sinking Deep Shafts.

An English engineer, Henry D. Avery, is the originator of a new idea in shaft sinking, by which it is made possible to keep the excavation free from water. To do this a large bore hole is first sunk on the site of the proposed shaft, and a pump is placed at the bottom of this hole. Whatever water may be encountered in sinking the shaft about this hole flows into the hole and is pumped to the surface. While this does not obviate the necessity of pumping, it keeps the excavation drained and free from water.

THE Bethlehem (Pa.) Iron Co., has been experimenting with the use of petroleum for fuel in its puddle furnaces, and the experiments have proved successful. During twelve hours November 21, six "heats" of iron were made. When coal is used but five heats are made in the same time.

PIPE-BENDING MACHINE.

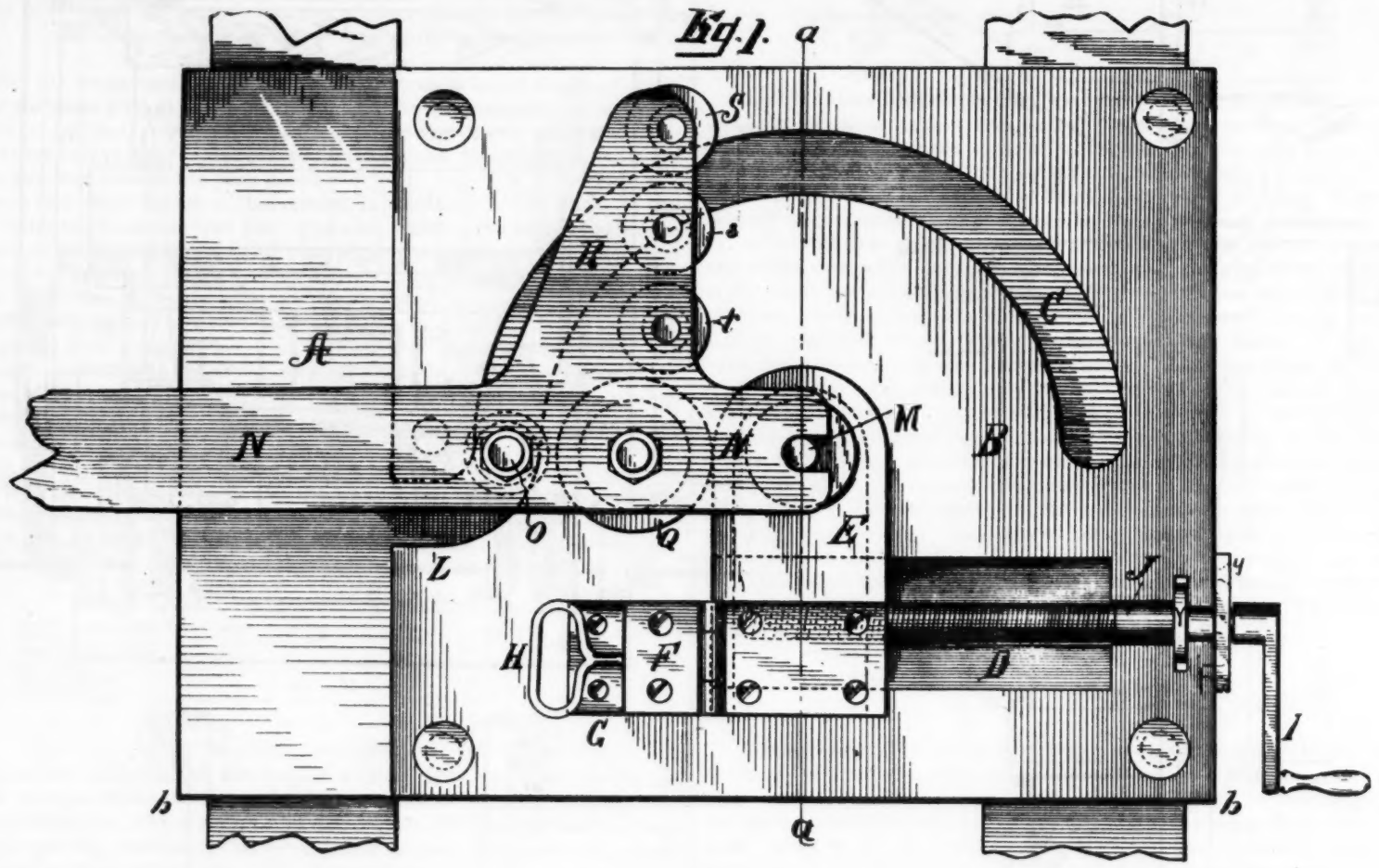
James F. Doyle, Detroit, has invented a new and useful improvement in pipe-bending machines, herewith shown.

This invention relates to pipe-bending machines, and has for its object a machine by which an iron or other pipe can be bent cold to a full half-turn or less, as may be desired, without producing any of the unequal buckling or collapsing that is usual when empty pipes are bent cold. In the cuts, Fig. 1 represents a plan view. Fig. 2 represents an elevation at the side *b b* of Fig 1. Fig. 3 represents a section at the line *a a* of Fig. 1. A represents the top of the table or any other firm support, to which is firmly attached the plate B. Usually the plate B is slightly elevated above the top of the table, but it may be fixed firmly down upon it, providing the guiding cam or groove C is undercut. Through the plate B is a slot I, within which rests a sliding former E. To the former E is hinged a grip-block F, that normally drops down between the former E and a stop-block G, fixed to the plate B.

H represents a handle attached to the grip-block F, utilized to turn the grip-block F on its hinge. A winch I and screw J serve to press the former E and grip-block F against the stop G or to withdraw them, if desired, the arrangement for accomplishing this purpose being the usual one of turning the screw J, which is held from longitudinal movement by collars Y, *y* in or on the former E. A plate K on the under side of the former E overlaps the edges of the opening D and prevents the former from escaping from the opening. Through the plate B is a second opening or slot C, semicircular in form and having an enlarged portion or extended portion L at one end. This extended portion may be merely an enlargement in the size of the slot C, or it may be cut entirely through the side walls of the piece B. The end of the former E is semicircular and is concentric with the groove B, and at the center of the concentric circles, extending above the top surface of the former E, is a pin or bolt M, against which rests the concave end of the lever N. Through the lever N is passed a pin O, carrying below the lever and in the groove C a shaft *o*, carrying a friction-roller P. (Shown most plainly in Fig. 2.) Below the friction-roller P is the head or cap *p*, that prevents the lever from rising above the plate B or away from it, as the lever N is turned on the center M. There is also mounted on the lever N a roller Q, arranged to rest closely against the former E as the lever N is turned around the center M, and on an arm or offset R, extending from the lever N, are mounted a number of rollers, of which each outer one is slightly nearer to the end of the pipe under operation, when that is first placed in the bending machine and is straight than is the next roll toward the bending or forming roll Q. Thus the roll S leads slightly the roll *s*, and the roll *s* leads slightly the roll *t*, and the roll *t* leads slightly the forming roll Q. The former E and the rolls S, *s*, *t* and Q are all grooved with a radius of curvature equal or nearly equal to the pipe to be operated on, so that the tubular opening between the former E and the grip-block F is slightly smaller in what may be called its "horizontal diameter" (shown in Figs. 2 and 3) than the pipe which it is desired to bend, and thus is insured a tight grip on the pipe.

The pipe to be bent is placed through the tubular opening between the former E and the grip-block F, with the end to be bent extending beyond the curved part of the former E and in front of the rollers Q, *t*, etc. The lever N is then pulled round, and the rollers pressed against the pipe, because of the movement of the roller Q in the circular slot C, bend the pipe into a quarter or half circle, as may be desired. After the pipe is bent into the required curve the lever N is returned until the roll Q passes into the part L of the slot C and is removed from over the pipe. As soon as this is done the grip may be loosened, the grip-block F lifted, and the pipe removed.

The inventor informs us that while the cost of bending various sizes of pipe is reduced to a great extent by the use of this machine, it is especially adapted to the bending of extra heavy 1¼-inch iron pipe for Baker heaters used in railway cars—for which it was particularly designed. It is now in successful operation at the works of the Pullman Co., where its use has resulted in a saving of over 75 per cent. in the expense of bending this class of pipe.



PIPE-BENDING MACHINE.

The Manufacture of Steel and Ingot Iron.

Mr. R. S. Casson, of Round Oak Iron Works, Brierly Hill, Staffordshire, has devised some improvements in the manufacture of steel and ingot iron, the object being to provide improved means for carbonizing the molten metal so that the amount of carbon in the resulting metal may be more or less accurately determined. To this end he introduces the carbon (preferably in the form of charcoal) into the casting ladle, and then taps the metal direct from the converter or furnace into the ladle, after adding any desired quantity of ferro-manganese or other material. In this way a high percentage of carbon can be readily introduced into the metal, and a high grade of steel produced. In practice, for producing a high grade steel capable of standing from 26 to 54 tons tensile strain, Mr. Casson proposes the use of about 5 lbs. weight of finely ground charcoal per ton of metal, and also to increase somewhat the usual percentage of ferro-manganese. Other forms of carbon than wood charcoal may be employed so long as they do not contain such a high percentage of sulphur or other ingredients as would be injurious to the resultant steel.—[Glasgow Engineer.

Improved Iron Process.

At the recent meeting of the Iron and Steel Institute, the contribution of Mr. Massenez was in many respects the most valuable. Manganiferous molten pig, poor in sulphur, is added to sulphureted pig iron, poor in manganese; the result being that the metal is desulphurized, and a manganese sulphide slag is formed. The mixer in which the process is carried on is a large vessel, in appearance, to judge by the drawings shown, like a converter. The apparatus in use at Hoerde will hold seventy tons of molten pig, but it has been shown that a vessel of about twice the size would be advisable. Details of the working are given by the author, and will be of great use to steelmakers working with phosphoric pig. In the discussion which followed several speakers bore testimony to the value of the invention, Sir Lowthian Bell intimating that a saving of 2s. 4d. per ton could be made by this method over the process of remelting pig in the cupola.

Deep Shaft Sinking.

The cost of sinking deep shafts is great. For instance, the modern iron ore mine shaft costs about $100 per foot. No less than this. In the case of some of the mines that have to sink 1,500 feet before the ore is reached, the expense is a very heavy one. There is $150,000 to make an avenue through which to hoist the ore, and besides this much more is needed to properly equip the property. This gives one an idea of the immense capital required to open up and place in operation the deep-seated mines. The ore must pay for it all. There is $15,000 yearly to be met with that is represented by the shaft alone.—[Iron Ore.

THE DRIFT OF TRADE.

Activity in Farm Implement Lines.

The demand the past few months for seasonable goods has been especially active, a condition of affairs which can be directly traced to the excellent crops and good prices received for them. The farmer has had money and has been able to liquidate all debts and purchase needed implements. Business is also active in the few lines of goods which are now in season, such as horse powers, feed cutters, grinding mills, corn shellers and similar lines. The demand is in some cases reported to be all that the manufacturers can take care of promptly, and in other quarters where the trade is not yet so strong in tone it is expected that cold weather will bring heavy reinforcements to the orders now in—[Farm Implement News.

A Disappointed Pig Iron Prophet.

Predictions that the tide will turn at a certain season, or on the occurrence of certain contingencies, are out of order, so far as I am concerned, since my \$18 October Bessemer suggestion failed to make connection; but I do not believe that it will be inviting another defeat, if I assert that conditions must and will gradually grow decidedly better. Life is made up of alternating experiences, and neither the agreeable nor the disagreeable endure very long, except in peculiar instances, or with those who are shiftless, indolent or incompetent. Change is the order of nature, and every object and every subject obeys this rule, and the condition of our affairs, or of the influences which govern the tenor of such conditions, seem to become aggravated just before the occurrence of a change in their character, whether that character be of a disagreeable description or otherwise.—["Cold Short" in Ohio Valley Manufacturer.

Mining a Million Tons of Anthracite a Week.

From a railroad standpoint, the hard coal trade may be showing good results just as present, but from a business point of view (the mining and selling of coal) it does not offer any great reason for congratulation either present or prospective. It is all very well to "point with pride" to the tonnage of over a million tons a week, but no one who is possessed of ordinary common sense can expect that such a tonnage can be continued for any length of time. The stories set afloat by some persons of the great demand in certain directions have very little element of truth in them. The Western trade is getting its anthracite forward as quickly as possible, for the season is rapidly drawing to a close wherein shipments can be made. Shipments west of Buffalo, by water, are some 2,000,000 tons, or about the usual quantity (except during the boom year of 1888) that is generally sent in that way.—[Coal Trade Journal.

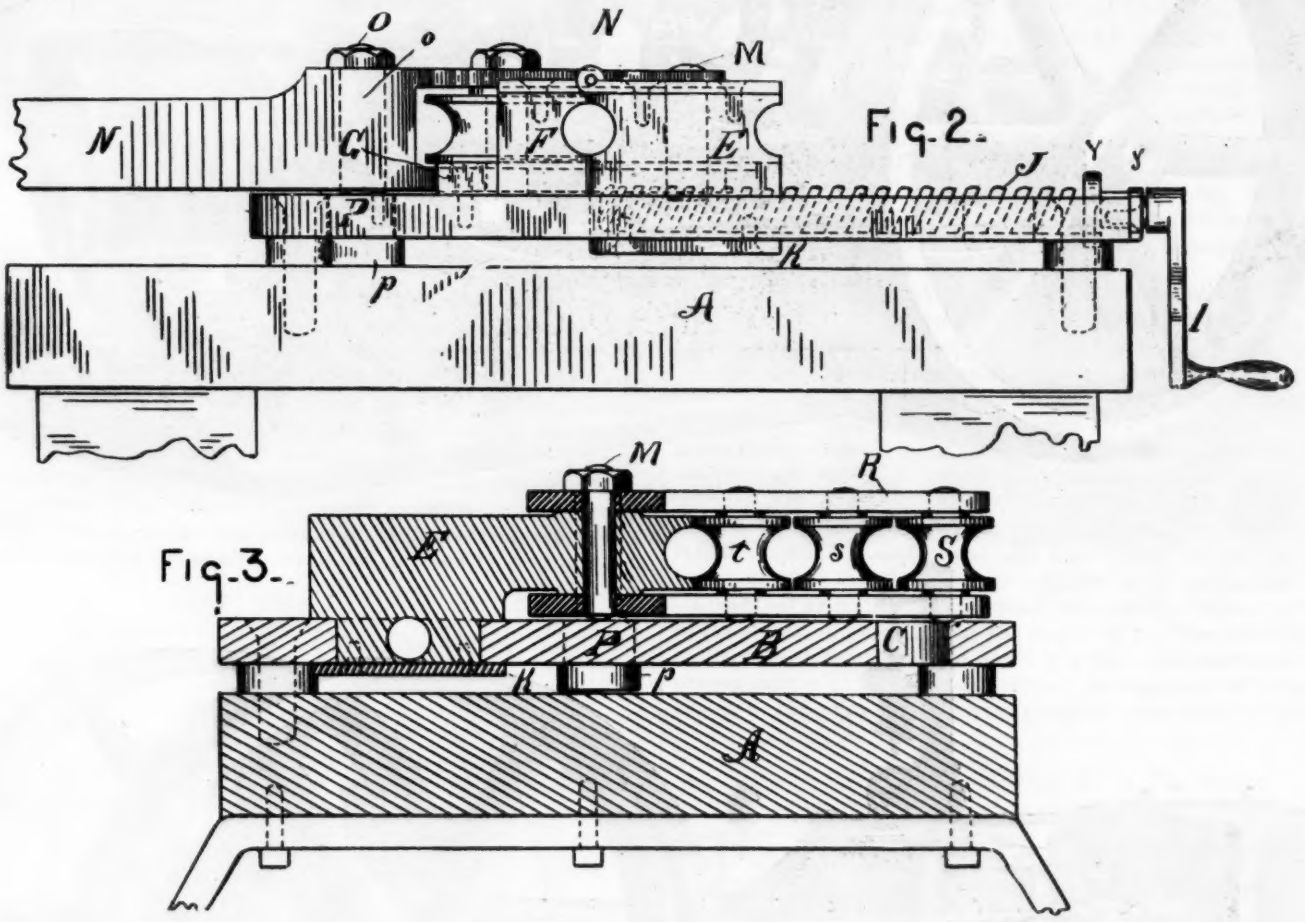
Western Wants being Supplied by Western Manufacturers.

This year more than ever before complaints are wafted to us from the East of the encroachments of the Western manufacturers and jobbers in the field hitherto almost exclusively occupied by the Easterners. Perhaps we are unjust in saying that these statements are complaints. The growth of the West in population and in material prosperity has gone on very rapidly, and the consumption of all kinds of manufactured products is, of course, stimulated by the ability to get them quickly and cheaply. These facts have proved a great impetus in the development of manufacturing and other industrial enterprises in the West and Northwest. Now, manufacturers and jobbers in the East who have had the control of Western and Northwestern markets feel this competition. At the same time it must be conceded that there are a great many manufacturing lines which have not been and are not likely soon to be developed in this section. In these directions the Eastern manufacturer will always find a field for his product here. Other manufacturers will be compelled to seek new markets for the surplus which cannot be disposed of in their own immediate vicinity, and it is such manufacturers who will be most largely benefited by reciprocity treaties already in operation, or in process of negotiation. Meanwhile, the great section west of the Mississippi is more independent year by year. Self-reliance was one of the earliest lessons taught it, and the teachings have not been forgotten as the years have passed.—[Hardware Trade, Minneapolis.

GERMAN MANUFACTURERS AND THE WORLD'S FAIR.

Discussing the question of German representation at the Columbian Exposition, *Kuhlow's German Trade Review* (Berlin) says:

With regard to the tariff policy of the United States and its effect upon the German industry, especially that of Saxony, we will at present keep silent. It would perhaps be as well to remind the people of Germany that no definite judgment has been as yet pronounced upon the McKinley Bill; in certain cases the export appears to have increased rather than diminished to the United States. In addition fears have been expressed by manufacturers that Americans would imitate the patterns of the articles sent to the exhibition. This might, of course, happen in certain instances. In general, however, we might say that if the Americans wished to obtain patterns they would be enabled to do so owing to the great development of trade in a much cheaper manner than organizing an exhibition which is going to cost them \$25,000,000. Then it must also be remembered that the patterns for the coming exhibition will soon become out of date, so that those who did imitate them would find it difficult to realize any profits on the experiment. To the fears that the international trade would be damaged a great deal of attention has been paid. In the opinion of several large New York traders German industry need have no fear of endangering its present business relations at the exhibition. American importers consider that great advantage may accrue to German trade by the exposal of its products to the world's gaze at Chicago. On the other hand, if it is feared that the trade might pass from the hand of one manufacturer into the hands of another, then the name could be suppressed and the goods exhibited according to the different branches of industry to which they belong. On the part of the Imperial Commissariat everything would be done in order to make it a national rather than an individual representation. With regard to the duties or fees it is not to be expected that the affair should be completely free; but the American boards have made an assurance that if the goods are to mingle in the traffic of the country after the close of the exhibition they will be fairly taxed according to their values. The Imperial Commissioner received in conclusion the warm thanks of the different Chambers present, and he was assured that opportunity should be afforded him to come into personal contact with the several groups of industries concerned. On all sides the hope was expressed that the industries of Saxony would be worthily represented at the exhibition, and the meeting would greatly contribute to this much desired result.



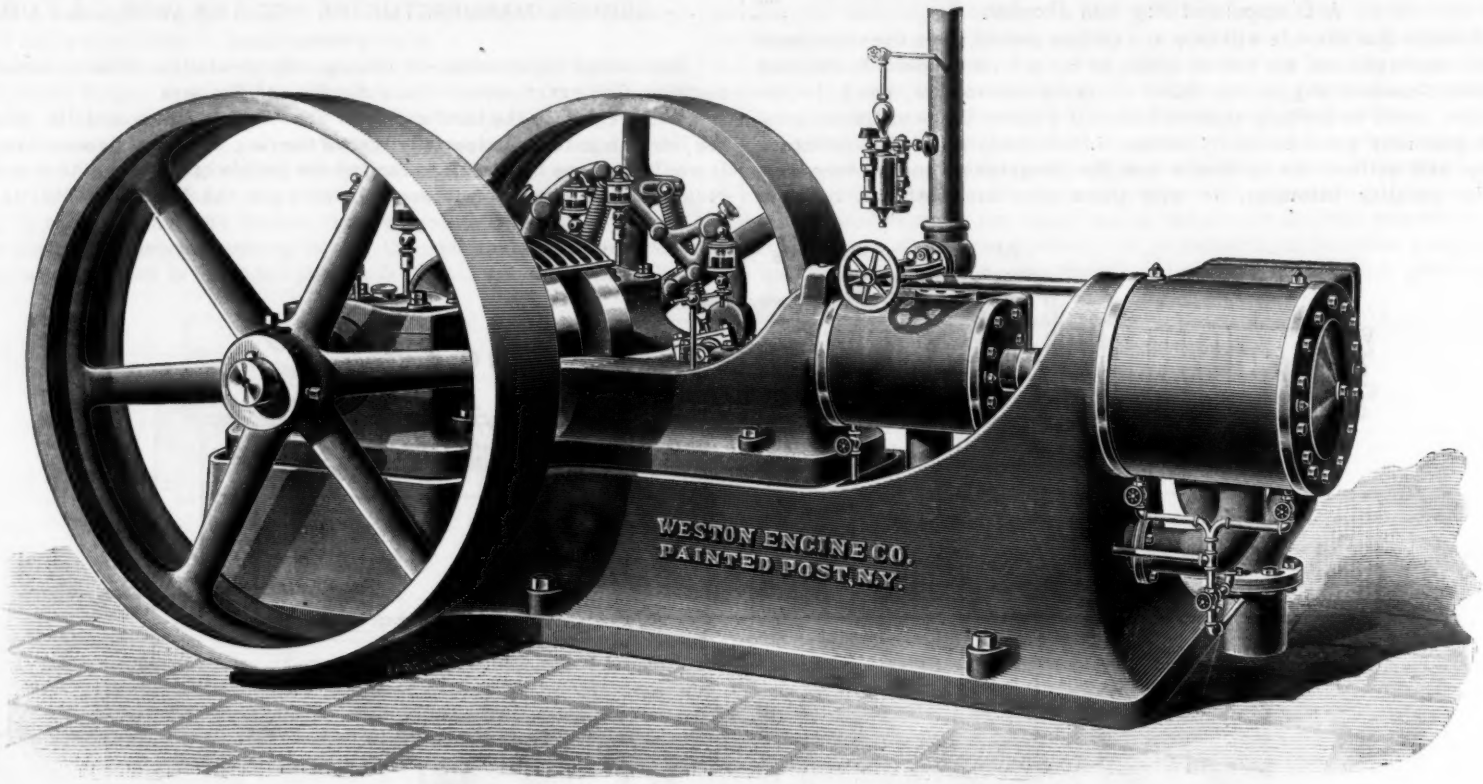
PIPE-BENDING MACHINE.—(See page 6.)

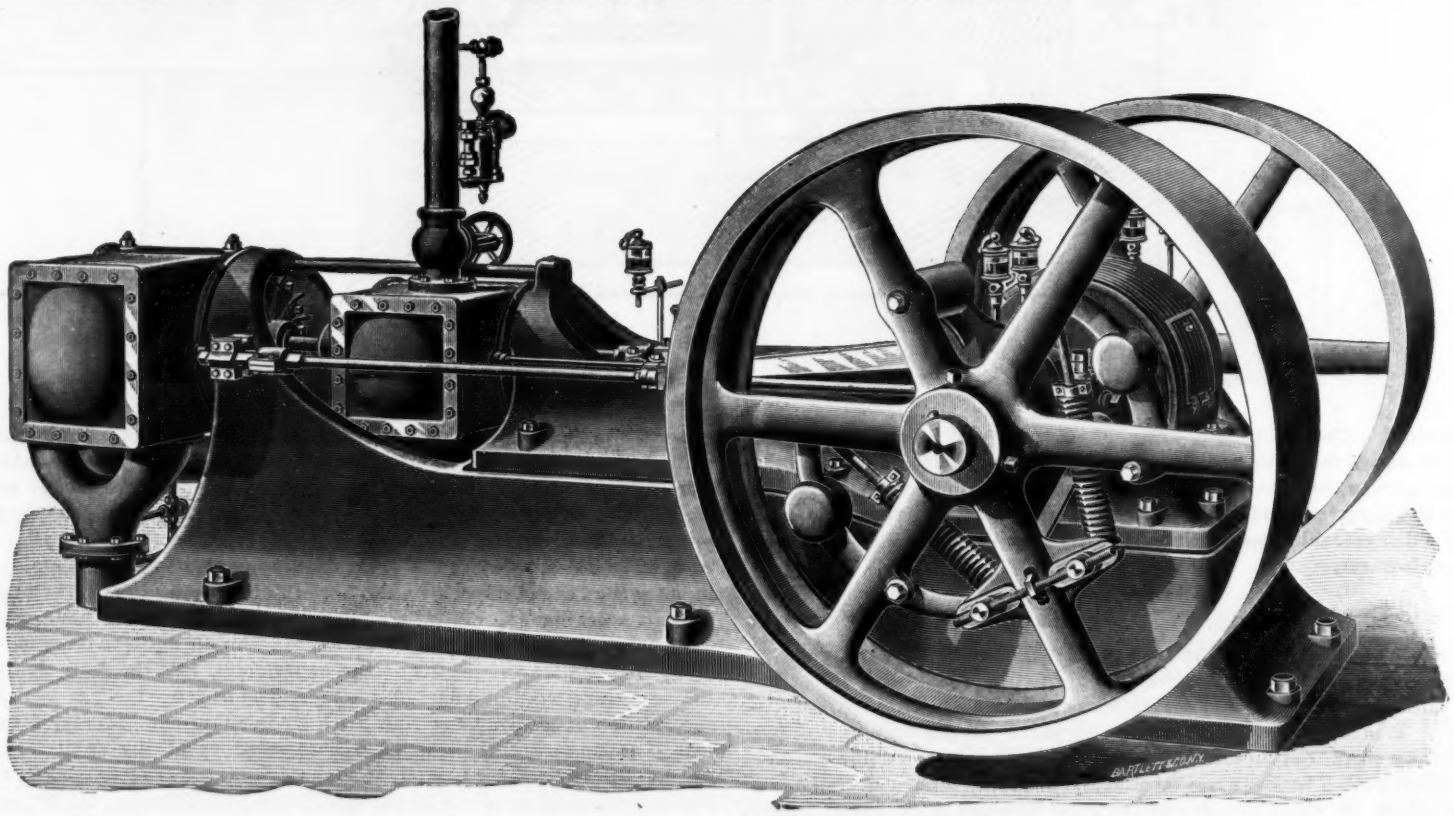
THE WESTON CMOPOUND ENGINE.

The accompanying illustrations are of the Weston Compound Engine, built by Weston Engine Co., Painted Post, N. Y., and handled in New York City by the Julian Scholl & Co., 40 Cortland street. As will be seen the sub-base is made a part of engine proper by extending it and projecting a neck in front of high pressure cylinder for the attachment of large or low pressure cylinder. This arrangement has several advantages, principal among which is the accessibility of low pressure cylinder for inspection. As leakage from this cylinder represents the most serious loss, it is obvious that the usual practice in tandem compounding of making low pressure cylinder practically inaccessible is a mistake, as if no opportunity is given for examination of the piston, the loss from this item may be enormous. As it is arranged in the Weston Engine there is every opportunity for inspection. Another advantage of this form is in the total elimination of cylinder vibration, indicating great rigidity and securing permanent alignment.

These engines have a balanced four admission valve on each cylinder, and both valves are attached in a direct manner without rocker arms to automatic governor, thus keeping the load about evenly divided between the two cylinders. This has decided advantages over the usual arrangement of having low pressure eccentric fixed to shaft, or at best adjustable by hand, for owing to the variation of load constantly occuring in some lines of service, such as electric lighting, electric railways, rolling mills, etc., the hand adjustment is of little value as the engine must be set for the entire run, before starting to the maximum load that may be thrown on during the run, and as the actual load is considerably less during most of the time, the vital feature of compounding is destroyed; whereas with the automatic attachment to each valve, the engine is always in condition to take care of any load within range of its capacity, and without disturbing any of the essential elements of compounding. This feature of two automatic valves must be well received under any circumstances and where strict economy of fuel is necessary, its use is imperative.

The stuffing-boxes are usually a source of considerable trouble, which the designers have succeeded in reducing to a minimum. The valve stem is packed only against exhaust steam and will run indefinitely without repacking. The connection of rod to valve is so constructed that any wear of the latter will not bind the rod in the stuffing-box. The piston-rod stuffing-box, as shown in a section of the cylinder (Fig. 3), is of novel design and equally novel behavior. In this box there is a large amount of packing which cannot be very tightly compressed, and the manufacturers find that, if properly packed, the steam pressing on the gland follows up the wear and obviates any necessity for adjustment. A further advantage is obtained by allowing clearance between glands and body of stuffing-box, so that any wear of cross-head shoe will not bring the piston-rod to bear upon the glands, the clearance allowing the rod to assume any position without binding in the box. These engines have been run, without leaking, for over a year, without repacking or even adjustment—a result which we believe to be unusual.

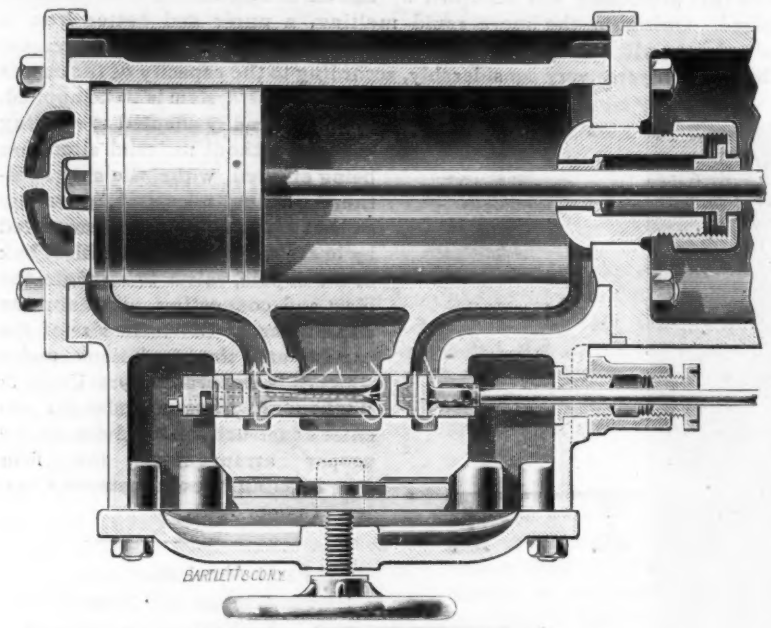




WESTON ENGINE FRONT AND BACK VIEW.

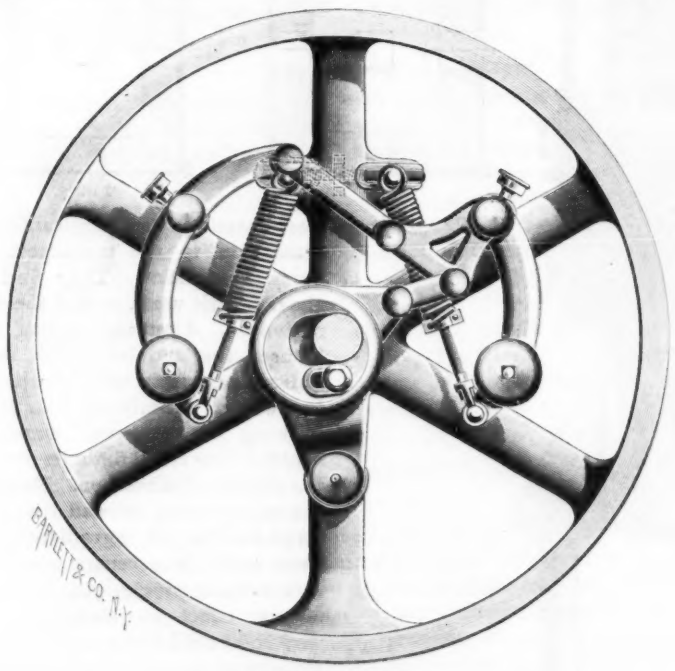
The governor (patented) Fig. 4, is of that class which has a laterally movable eccentric surrounding the crank-shaft of the engine, by which the admission of steam to cylinder is regulated through the variation of its throw. This variation is effected by the movements of centrifugally acting weights connected by levers to the eccentric, while the centrifugal motion of these weights is resisted by centripetally acting springs, the free ends of which are attached to weight levers, the other ends being attached in an adjustable manner to fly-wheel. With the governor at rest the tension of the springs will hold the eccentric in position of the greatest throw, but in action the centrifugal force of the weights moves the eccentric across the shaft, reducing

its throw as increased rotary motion takes place, until it reaches the point where the valve travel will be in accordance with the amount of steam necessary to drive the load. It is apparent that for any nicety of regulation, the centrifugal force and the centripetal force, as supplied by the weights and springs, should be in equilibrium. This is a requirement very difficult to meet, and a further complication arises from the position of the eccentric constantly changing to accommodate the variable loads thrown on the engine, thus requiring the spring and weights to be in equilibrium at any possible position. Centrifugal force increasing in a certain ratio makes it necessary to



SECTION THROUGH CYLINDER.—FIG. 3.

attach springs to wheels at points that will increase the tension, as springs are distended, in same ratio. These points of attachment cannot be found accurately by any method of calculation, and consequently the adjustable attachment must be resorted to. This enables, in a very short time, by trial, to get the position of sensitiveness sought. It has been usual, heretofore, in this class of governors, when supplied with sensitizing device, to accomplish adjustment from two points of the wheel, diametrically opposite. This arrangement is necessarily awkward, as it compels the turning over of the engine one-half revolution before effecting adjustment, which is often almost impossible; and adjustment cannot be made with extreme accuracy, as one may be placed at its sensitive point and the other sufficiently misplaced to



GOVERNOR—FIG. 4.

counterbalance the efficiency of the first. A further disadvantage is in the unequal tension given to springs often causing breakage of either spring, from said spring having been made to overcome an undue proportion of the centrifugal force.

An inspection of cut shows that the manufacturers overcome these objectionable features by an arrangement which allows both springs to have their attachment to wheel on the same side. This admits of a right and left hand screw, with nut in centre, being inserted in the two spring attachment pins, the turning of which moves simultaneously, and an equal distance, the two springs near to, or farther from, the pivotal points of levers, thus accomplishing the regulation of governor to a degree equaling isochronism if desired. This governor has proven so effective, in all cases, that the manufacturers are prepared to guarantee a regulation within 2 per cent. from friction to full load, and with any change in boiler pressure to a point so low that the engine must take steam 7-10ths of the stroke to do the work.

A COMPANY is being organized in Lockport, Ill., for the manufacture of plain and barbed wire, which will give employment to a large force of men.

AN INTERESTING EXPERIMENT WITH STEEL.

Charles Wetterer, 809 Columbus Ave., New York City, writes the *American Machinist:*

It appears that the idea that steel is a chemical combination of iron and carbon is universal; but where is the proof? When two elements combine chemically the nature of both changes; this does not happen when iron is carbonized, but a change does take place; the pulverent carbon melts. Well, it will be said carbon has never been melted. Be pleased to hear my explanation. The atoms of carbon buried in molten iron are in a very different position, for instance, from that of electric light carbons; it does appear that the fact that the iron is molten has a greater effect on the carbon than the temperature itself. To this action we have a parallel in ordinary illuminating gas, concerning which a prominent work on chemistry says; "The light and gaseous hydrogen possesses in a great degree the power of rendering other bodies aeriform, on uniting with them, even those which are not volatile, just as an eloquent speaker can communicate his enthusiasm to an indifferent audience."

To prove this idea I have succeeded in crytalizing carbon taken from steel wire nails, iron cut nails, and steel filings, by dissolving them in acids. It is, however, a difficult thing to do, the chief obstacle being that about 98 per cent. of iron must be dissolved in order to obtain about 2 per cent. of carbon. If the dissolution of the iron is violent, the gases generated carry the nascent carbon to the surface, where it is oxidized by the oxygen in the air, causing small explosions that are easily perceived in sunlight; to this nascent state of the carbon its power to crystalize is due. If the action is less violent, or the carbon artificially obstructed, that which is so obtained resembles lamp-black; sometimes a body of the same consistency is formed, but it is white.

My first experiment was to dissolve a small quantity of steel filings in about a teaspoonful of acid, which resulted in a few small crystals, but nevertheless larger than the grains of steel; by pressing these crystals into my thumb nail and drawing them across glass, they cut or scratched as only diamonds can. The result of the past six months of experimenting is small, but sufficient, I think, to establish my theory.

It may be mentioned here, in support of this argument, that diamonds, on being placed in the electric arc, melt, oxidize and disappear like a flash; carbon in steel, on being burnt, behaves in the same manner, which would indicate not alone the separate existence of carbon, but that it is molten.

It appears to me as reasonable, that, when steel is heated, the atoms of carbon have a tendency to unite, and form comparatively large particles; when slowly cooled these particles remain large, but on being chilled the molten particles are shattered to atoms; in this way the surface area of diamond presented to iron may easily be increased from ten to one hundred times. With this increased surface, contact, and the more thorough diffusion, it is not difficult to understand why steel should harden on being chilled. It is also possible that the different conductivity of carbon and iron, and electric currents set up in the chilling metal, have their influence on the arrangement of the atoms, and possibly on the degree of hardness or tenacity; by drawing temper the atomic diamonds begin to gather and rearrange slowly, until the proper degree of hardness or size and arrangement of diamond particles is shown by the color, when further progress is arrested by quenching.

An Ohio Rolling Mill's Big Record.

A Massillon (O.) correspondent of the *National Labor Tribune* writes: In your issue of the 24th, I notice that your Youngstown correspondent in writing up the news from Girard says that the 10-inch mill of that place made a very big run on one turn, namely, 47,090 pounds, which he says beats the famous Joseph Corns run the year before by 600 pounds. For the information of your correspondent and others I would say that they must try again, as on November 24, 1890, on the night turn, we made 49,858 pounds; November 25, day turn, 49,506 pounds; November 25, night turn, 47,770 pounds; November 26, day turn, 48,726 pounds; night turn, 47,092 pounds, and that on 9-inch mill and not on 10-inch mill. The last four turns of the above list were sheared to lengths. I just give the above as being successive. As for 47,000 pounds, we have made that time and again and took no notice of it.

Pig Iron Cost at Carnegie's.

In nosing about I have run against the information that one, who is regarded as extra creditable authority, fixes the present costs for making Bessemer pig iron, by such concerns as Carnegie & Co. at $14. Now I do not propose to attack the veritableness of this report or question its authenticity, but I do intend to remark that, if the Carnegie furnacemen can make Bessemer pig at $14, they are pretty much alone in their glory. I do not know what it is costing the average furnacemen to make Bessemer pig, and if I did know I would not give the knowledge away, but I am free to say, that if Carnegie & Co can make it at $14, or thereabouts, they have a very respectable margin and a very isolated individuality.—["Cold Short" in Ohio Valley Manufacturer.

The Steel Trade of Scotland.

In the course of the last four or five weeks (says the *Economist*) a distinct improvement has taken place in the position and in the immediate prospects of the steel trade of the West Scotland. This is owing to the large and unexpected accession of shipbuilding orders to the Clyde, the calculation being that since about the beginning of September till now there have been not fewer than 70,000 tons of new work placed on the river. Nearly all the makers say they are well provided with work for the rest of the year, which, of course, renders them somewhat independent, and if new inquiries of any moment now were to come upon the market little difficulty would probably be experienced in giving a further lift to prices.

THE GREINER PATENT ECONOMICAL CUPOLA.

John S. Unger, M. E., and T. A. Wigham, forming the firm of Unger & Wigham, 301 Phenix Building, Chicago, say that in placing the Greiner patent ecomomical cupola before the foundrymen and steel manuufacturers in this country, they have the advantage of the splendid results already obtained with this cupola in Europe, where upwards of 400 are in daily use. The adoption of the Greiner system of melting iron there has met with the most satisfactory results. In no case has the saving of fuel been less than 15 per cent., and in some instances it has reached 40 and even 50 per cent.

The novelty of the invention consists in a judicious admission of blast into the upper zones of a cupola, whereby the combustible gases are consumed within the cupola, and the heat utilized to preheat the descending charges, thereby effecting a saving in the fuel necessary to melt the iron when it reaches the melting zones. In order to fully explain the principle of its workings, we illustrate in Fig. 1 a cupola of the ordinary design, with a single row of tuyeres or air inlets, *a a*. The incoming air burns the coke in front of the tuyeres to carbonic acid gas, a combination indicating perfect combustion. As this gas ascends through the incandescent coke above, most of it is converted into carbonic oxide by the absorption of an equivalent of carbon. The result of the combustion is, therefore, a

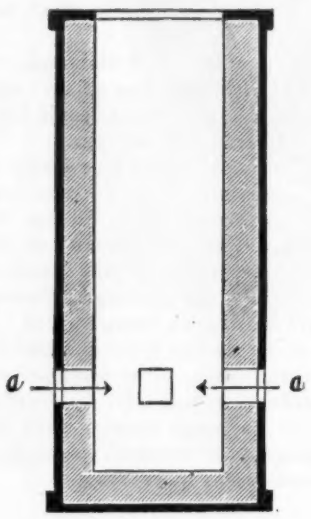
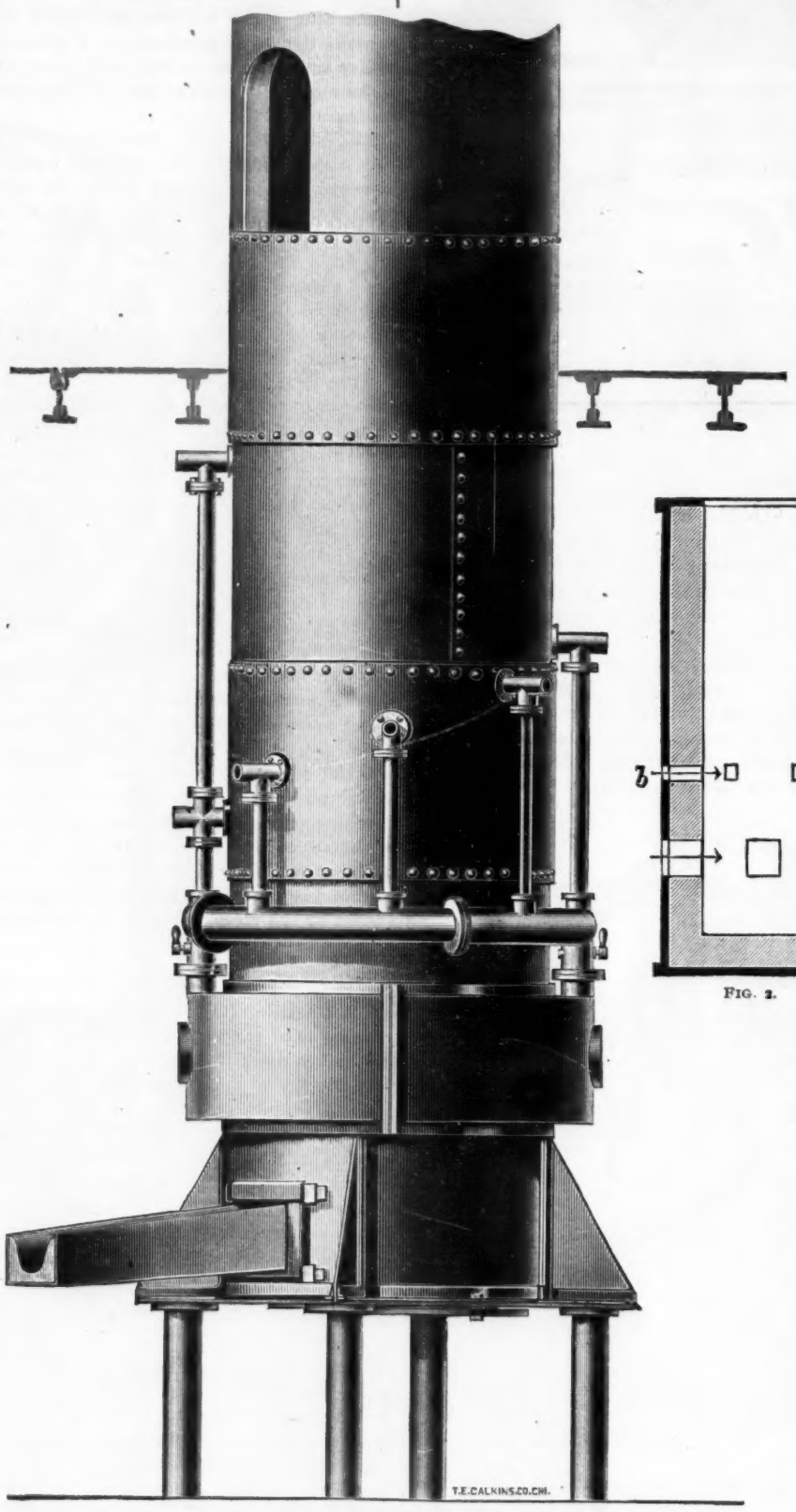


FIG. 1.

gas mostly composed of carbonic oxide (CO), indicating an imperfect utilization of the fuel, as one pound of carbon burned in carbonic acid, (CO_2) will develop 14,500 heat units. Whereas, the same amount of carbon burned to carbonic oxide (CO) will only develop 4,480 heat units, or less than one-third of the heat developed by perfect combustion. To avoid this loss of heat additional tuyeres have been placed at a short distance (Fig. 2, *b b*) above the lower tuyeres to introduce air to consume the carbonic oxide (CO), but such arrangement does not have the desired effect, because the material at that place in the cupola has a very high temperature, consequently the entering air also ignites the coke, so that the action of the lower tuyeres is simply repeated, and carbonic oxide (CO) again formed at a short distance above *b b*. This led Mr. Greiner to the following conclusions: In every cupola there must be a point (*c c*, Fig. 3) above which the descending materials have not yet reached the temperature necessary for the ignition of the solid fuel, while the ascending combustible gas is still warm enough to ignite when brought into contact with air. It is clear that air, if properly admitted above that point, will cause the combustion of the carbonic oxide (CO) without igniting the coke.

But if all the air necessary for the combustion of the carbonic oxide (CO) be admitted at one place, or in one horizontal row of tuyeres, the heat developed will very soon raise the temperature so as to set fire to the coke, producing loss of carbon as before. Hence the upper blast must not be introduced on a horizontal plane, but through a number of small tuyeres, arranged (either in the form of a spiral or otherwise) so as to embrace the higher zones of the cupola, and must be regulated, both as to pressure and to arrangement and dimensions of pipes, according to the capacity of each particular cupola. The combustible gases are thus burned without heating the coke to incandescence, and the heat thus developed utilized to preheat the iron and the coke, so that they reach the melting zone at a higher temperature, and require less heat to effect the melting.

Another point in favor of the Greiner economical cupola, and which is very important in most foundries and steel works, is that the application of the Greiner system will increase the melting capacity of the cupola, owing to the more rapid melting in the fusion zone, and to the additional room in the cupola that previously was occupied by the extra amount of coke not now required. Owing to the more rapid melting, a purer and better iron is obtained. As will be understood, the number, size, position and arrangement of the upper tuyeres vary considerably, according to the capacity of the cupola to which the system is to be applied. It can be readily adapted to existing cupolas, without material alteration being effected, while the only additional fitting necessary, generally consist of a circular pipe connected by branches with the main blast box of the cupola, valves to regulate the blast and connecting pipes for the small tuyeres. Given the size of the cupola, and the conditions under which it is worked, Messrs. Unger & Wigham are prepared under the patentee's instructions to advise on the proper arrangements, the firm guaranteeing in each instance a saving of 15 per cent.



THE GREINER PATENT ECONOMICAL CUPOLA.

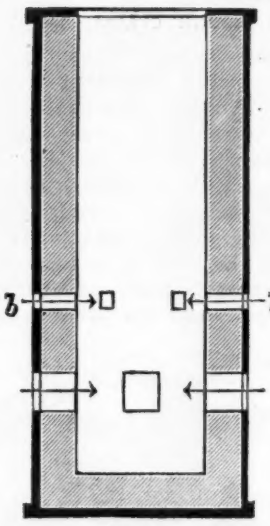


FIG. 2.

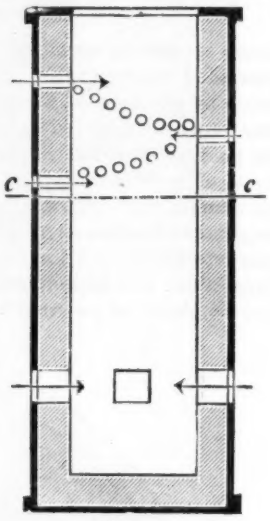


FIG. 3.

Facts About Aluminum.

Herren Lubbert and Roseher have been testing the applicability of aluminum to the manufacture of every-day articles. They find that the domestic usefulness of the metal is limited. Aluminum should never be used for articles which are required to come in contact with boiling water. Aluminum tins for the packing of conserves should be avoided; the metal finds its way into the alimental substance. Moreover, the experiments showed that a very large number of ingredients, as organic acids, in presence of cooking salt, herring pickle, etc., have a dissolvent effect on aluminum. The very light field flasks constructed of aluminum are not adapted for introduction in the army, as spirit of verdigris, citric acid and tartaric acid, of only 1 per cent. strength, exercise a prejudicial effect on the metal. Red Bordeaux and and Moselle wine, and even coffee and tea infusions, owing no doubt to the tannin contained in them, have also a tendency to dissolve and absorb the "metal of the future." Aluminum is, further, not adapted for objects which require to be cleaned with soda or soap, or to be brought into contact with these substances; nor is it destined to play an important part in the manufacture of chemical utensils, as the ductile metal is attacked by such elements as phenol, salicylic acid, and boracic acid.

EXPANDED metal is being put to a use which is novel, at least in this section. The Messrs. Chess, of Chess, Cook & Co., of this city, manufacturers of expanded metal, steel sheets, tacks, etc., are having residences built in which the material mentioned is fastened to studding on the outside and inside and then covered with cement. It is claimed this form of construction affords an opportunity for pleasing effects at a much less cost than stone, also makes a durable structure, not easily burned.—[American Manufacturer, Pittsburgh.

SPIRIT OF THE TRADE PRESS.

RECENT ACHIEVEMENTS OF AMERICAN MANUFACTURERS.

Shipping Hot-Polished Shafting to England.

The Mahoning Valley Iron Co. of Youngstown, O., recently received the second order for hot-polished shafting from George Richards & Sons, Limited, of Manchester, England. This concern received a similar order for export about three months ago.—[Bulletin.

Splendid Work of Virginia Blast Furnaces.

Virginia blast furnaces in the matter of coke consumption to the amount of pig iron from lean iron ores are said to be doing with Flat-top coke the best work that is done in this country. It is reported that the Ivanhoe and Crozer furnaces of the Southwestern Valley of Virginia are producing a ton of iron from 45 per cent ores with 2,200 pounds of flat-top coke, a result fully 15 per cent. better than can be shown at any furnace where Connellsville coke is used with similar iron ores.—[Shendun (Va.) News.

Southern Iron in Distant Markets.

Southern iron is finding its way into very distant markets. Recently eight hundred tons of iron were shipped from Ensley, Ala., to California, via Richmond & Danville Railroad to Baltimore, thence by ship to San Francisco. As soon as the Nicaraguan canal is constructed, the Pacific coast, from Washington to Chile will furnish a market for Southern iron and coal, and the sooner the Southern people see to it that the canal gets assistance from the government the better it will be for their future commerce and manufactures. —[Dixie.

American Hardware in Europe.

There is no one corner of Europe where the American small cast hardware is not on sale. In the matter of the common box-wood pocket rules, the American manufacturers so far excel all others that, if not all European nations, certainly all nations outside of Europe, are supplied from America. The manufacturers there print on the rule whatever system of measurement is followed by the country for which the goods are intended. American augers and auger-bits are used the world over; and no other nation is able to compete. The Americans, with such facts before them, may well be proud of their manufactures.—[Iron, London.

Reciprocity and American Machinery.

That the recent reciprocity convention between this country and Brazil is helping American machinery interests seems pretty well proven by the fact that American exports of steam engines and machinery to that country during the five months since the treaty has been in force, viz.: April 1 to September 1, 1891, amount to $1,299,020, as compared with exports of only $233,376 during the corresponding period of 1890, being an increase of nearly one million dollars for the five months. The reciprocity agreement allows American machinery to enter Brazil free of duty, while formerly duties ranging from 15 to 48 per cent. had to be paid.—[American Machinist.

Fine Wire-drawing by a Woman.

Among the recent products of wire manufacturing is one having a measurement of 1-500th of an inch in diameter—much finer, of course, than the hair on one's head. Ordinary fine wire is drawn through steel plates, a method not adopted, however, for the minutest work, from the fact that if the hole wore away even in the slightest degree, the wire would thus be made larger, which would spoil the job. To obviate any difficulty of this kind the wire is drawn through what is practically a hole in a diamond, to which there is, of course, no wear. These diamond plates are made by a woman in New York, who has a monopoly of the art in this country. The wire is then run through machinery, which winds it spirally with a layer of silk thread that is .0015 of an inch in thickness, being even finer than the wire. This wonderful wire is used in making the receiving instruments of ocean cables, the galvanometers used in testing cables, etc.—[Age of Steel.

WHAT EXPERT OBSERVERS ARE SAYING.

"All the compounds of carbon upon which the civilized world chiefly depends at present for fuel must be exhausted within a few centuries. The anthracite of America will be used up within a few decades, while bituminous coal beds formed in the carboniferous and cretaceous epochs will be dug out within 1,000 or 2,000 years. Happily, however, the stock of bitumens in the rocks of the earth is practically unlimited, and in them will be found the fuels and illuminants of the future."—[Prof. W. J. McGee.

"The people suppose I have made money out of my inventions. The truth is, I have never made one cent out of my inventions. All I have made has been out of manufacturing. My inventions have not been protected by the Patent Office. The companies with which I am connected have spent millions in trying to defend them. I have spent about $600,000 myself, and I believe I would be $600,000 better off if I had never taken out a patent. What I have made has been because I have understood the inventions better and have been able to manipulate the manufacturing of them better than the pirates. I could not have made anything had I not had large capital back of me, and the ordinary inventor has no protection whatever."—[Thos. A. Edison.

"Few people would believe, unless they went fully into the matter, to what extent United States manufactures, in the engineering branches especially, are superseding British goods, both in the home and foreign markets. I went over the establishment of the largest importers of United States tools and machinery in England, the other day, and was surprised to see the quantity of these manufactures on order for all parts of the world."—[An Englishman, in American Exporter.

"I see no reason why there should not be as many new inventions in the next half century as there have been in the past. It seems to me that we are at the beginning of inventions. We are discovering new principles, new powers and new materials every day, and no one can predict the possibilities of the future. Take electricity. When we get electricity directly from coal, a lump as big as this tumbler will light and heat a whole house for hours, and a basketful would run a factory for a whole day. In the generation of steam we get only 14 per cent. of the energy of the coal. In electricity we get 96 per cent. When we get our electrical power directly from coal, a few hundred pounds will carry you across the Atlantic, and a few basketsful will take a railroad train from New York to San Francisco. I believe this to be one of the great problems of the future, and I have no doubt that it will be solved. I have been working on it for years, but I haven't got it yet. When it does come it will revolutionize everything. It will cheapen everything, and it will be the greatest invention of modern times. As it is now, we have to burn the coal to get the steam, and steam gives us the power which runs the dynamo and produces the electricity."—[Thos. A. Edison.

A BUNCH OF OPINIONS.

Perhaps one of the very best indications as to the future prosperity of the Northwest is shown in the fact that there has been no such business boom this Fall, as some sanguine people anticipated as the result of the immense grain yield and the large aggregate of money put into circulation. Indeed, many if not most lines of manufacturing and jobbing have been disappointed that the volume of business has not been larger. And yet in these lines business has been very good, indeed, if there has not been a boom, and in the absence of the latter is there not plainly discernable a growing caution, tacitly an evidence of conservatism, on the part of farmers and other consumers most directly benefited by the large crops?—[Northwest Trade, Minneapolis.

On the Hudson, the Great Lakes, the Delaware, the Mississippi, the Missouri, the Ohio, the Monongahela, the St. Lawrence, the Arkansas, the Tennessee, the Cumberland, the Sacramento, and a dozen other rivers, have sprung into existence cities that give glorious promise before the century closes cities that can claim tribute from areas as vast in extent as some European nations, and which are destined to become as populous and as opulent as the greatest centers of European population. At the rate of growth of the last decade the metropolitan districts of New York will in 25 years exceed in population the metropolitan district of London, the area of the two districts being about the same, and the decade will bring the population of Chicago up to that of Berlin, of Philadelphia up to that of Vienna, and St. Louis up to that of the world's great emporium of commerce on the Mersey, Liverpool.—[Census Superintendent, R. P. Porter.

Telegrams from Washington lead us to expect that before the end of the year a day will be fixed for the commencement of negotiations for reciprocity with Canada. In the first instance, Canada will be expected to furnish a project for the consideration of the American negotiators. It ought to be possible to agree upon a treaty which would be of mutual benefit. The adoption by Canada of the American tariff and the inclusion in the treaty of all the productions of both countries, are out of the question. On the other hand, we expect the schedule to contain something besides raw products.—[Monetary Times, Toronto.

Among the Magazines.

With its November issue (a superb one, by the way), the *Century* entered its twenty-second year. It is one of America's institutions to be proud of.

Lippincott's for December has a distinctly Southern flavor: all the contributions are from well known Southern writers. T. C. DeLeon writes the complete story, "A Fair Blockade Runner;" Sara M. Handy discusses "Negro Superstitions;" Thos. Nelson Page, "Literature in the South since the War," etc.

Persons interested in transportation topics will read with avidity "The Ocean Steamship as a Freight Carrier," by John H. Gould in November *Scribner's*. Mr. Gould describes the picturesque side of ocean freight traffic as well as the practical details of loading and unloading all kinds of freight, such as fruit, oil, grain, etc., for which especially designed steamers with unusual appliances have been made.

Harvester Manufacturers Co-operating.

The American Harvester Company, though it failed to accomplish its main purpose, brought the harvester manufacturers into close and confidential relations, and established a community of feeling, so to speak, that has been occasionally manifest to observers since, their conclusion to withdraw from the fairs being an instance. Considering this fact and looking over the whole situation, is it not reasonable to expect that other joint steps will be taken to cut off unnecessary expenses and to prevent practices that but lead to waste and to the demoralization of the trade? However, we are not looking for a revival of the American Harvester Co., or of any scheme that will meet with the disfavor of the trade; and possibly no joint action will be taken to remedy existing evils. We are merely forecasting on the situation.—[Farm Implement News, Chicago.

A Great Ocean Pier.

The Bureau of American Republics has information of the progress which is being made in the construction of the ocean pier at Puerto Colombia, Colombia, the new seaport five miles west of Savanilla, and which is in direct communication by rail with Barranquilla. The pier, when finished, will be 4,000 feet long, built entirely of iron and steel, with double line of rails its whole length and depth of water sufficient to receive alongside the largest ships afloat. Six to ten ocean steamers can be moored at the same time, and by means of hydraulic lifts cargoes can be quickly and economically handled. Already 2,000 feet have been finished, and the pier is actually opened for business to ships drawing 22 feet or less.

STEAM USERS Should Read this.
Increase the Capacity of your Boilers.
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SAVE YOUR FUEL AND PROTECT YOUR BOILERS FROM SCALE AND GALVANIC ACTION OF WATERS. WATERS ANALYZED **FREE** AND THE COMPOUNDS MADE TO SUIT EACH WATER.

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WRITE FOR INFORMATION AND PRICES. BEWARE OF INFRINGEMENTS.
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SHIPBUILDING.

The Largest Fresh Water Steamship.

The keel of the largest steamer on fresh water in the world will soon be laid in the ship yard of the Chicago Shipbuilding Co. in South Chicago. She will be 330 feet keel, 350 feet over all, 43 feet beam and 24½ feet deep, and will carry on the ordinary stage of water in the lake cannels over 4,000 tons. With an increase of depth of water on the Great Lakes, as now contemplated, the new boat will carry without trouble over 5,000 tons. She will be built for the Minnesota Steamship Co., for which the two steel steamers constructed last Winter at the Chicago shipyard were also built. A sister boat of exactly the same dimensions will be built at the same time at the Globe Iron Works, in Cleveland. Both steamers will be given power to drive them 14 miles an hour. They have triple expansion engines, 24, 39, 63 inches by 48-inch stroke, and will be fed by three 12x12 feet boilers. They will be ready for service at the opening of navigation next year.

Condition of Foreign Shipbuilding.

On the whole, Clyde shipbuilding is in a fairly satisfactory state, though some builders have but little work in hand. In October the vessels launched on the Clyde aggregated 26,492 tons, which is about 700 tons better than last year; but the new orders booked come much short of this, owing to the fact that about 10,000 tons of new work having gone to the yards on the Forth and Tay. Shipbuilders in the Northeastern ports are fairly well occupied, and are likely to be so throughout the Winter. The shipbuilding trade on the West coast has a fair amount of work in hand, and has prospects of some good contracts. At the time of writing, the engineers' strike is still unsettled, but hopes are entertained of a compromise between masters and men. Some fresh engineering work has been booked this week in Scotland for South America, and there is steady employment at most shops. Scotch iron founders, especially those with a large capacity, still complain of dullness: but all the boiler makers are busy. Engineers in the Northwest are slightly more active. Reports with regard to the engineering industries of Lancashire are still of an unsatisfactory character so far as prospects for the future are concerned, and with the exception of a few establishments largely engaged on specialties, there is a decided lessening in the weight of new work giving out.—[Iron and Coal Trades Review.

Our Busy Shipyards.

With the publication of each new shipbuilding contract, vesselmen hold up their hands and wonder if the lakes are to be filled up with tonnage, no vessels of large capacity are being lost, yet the desire is for more new vessels. Notwithstanding the views expressed during the Summer, that lake shipyards had better shut down throughout the Winter, as an overproduction already existed, it was a foregone conclusion that more or less tonnage would be ordered and built for the season of '92, and the prominent builders held their staff under salary, awaiting contracts which they were positive would sooner or later be placed. Specifications are at hand, this week, for the construction of a United States lighthouse tender, and some pretty close figuring will be gone over to bring this government contract to the lakes. The Cleveland Cliffs Mining Co. have also placed their order, which has been circling around shipbuilders for the past several weeks. The Flint & Pere Marquette Railroad are reported as desiring to make up the even half dozen in their fleet and have a No. 6 built. The Union Steamboat Co., of Buffalo, Lake Ontario parties and other firms have also asked for figures from builders, and there now seems no doubt but that lake shipyards will be kept busy during the coming Winter.—[Marine Record.

Symptoms of Shipping Revival.

The following items are encouraging signs of American shipping, thanks to the beneficent effect of the new ocean mail service law:

"It has been decided to establish a new line to Colombia. The company is an American one. The route will be from New York to Port Limon via Bocas, returning by the same route. The steamers may stop at other ports to avail themselves of the subsidies offered by the Government for carrying the mails. The Government of Colombia is to establish telegraph communication connecting Bocas with the cable."

"Articles of incorporation of the New York and Brazil Steamship Co. have been filed in the office of the Secretary of State of West Virginia. The concern is composed of New York and Brazilian capitalists, and has an authorized capital of $3,000,000. The President is Judge A. J. Dittenhofer; the Vice-President is Ex-Postmaster General Thos. L. James; the Treasurer is John N. Hayward, and the Directors are Messrs. Dittenhofer, James Hayward, Frank S. Gray, Rufus R. Tilson, Wylie J. Rouse and Mayer Hillman.

"The Bureau of American Republics is informed that the first steamship of the newly organized 'Mexican International Steamship Co.' will sail from Philadelphia for Vera Cruz, via Havana, Brogresso and Tampico the 1st of January. Steamers will thereafter be dispatched every two weeks, and if the business warrants a weekly sailing willsoon be inaugurtaed."

WORLD'S FAIR NOTES.

Four hundred railway lines have already agreed to return exhibits to the Exposition free of charge.

The last nail in the Women's Building at the World's Fair will soon be driven by Mrs. Porter Palmer.—[Ex. We hope it will not be her thumb nail. —[Boston Commercial Bulletin.

Sunday should be observed by the World's Fair management and by the rulers of trade and the industries in this country. It would be "money in their pockets" in every sense of the expression for them to take this advice. —[National Labor Tribune.

France, through Edward Bruwaert, the French consul at Chicago, has asked for 150,000 square feet of space in the Exposition Buildings—100,000 feet in the Manufacturers Building, 30,000 in the Fine Arts, 10,000 in the Live Stock, and 10,000 in the Machinery.

There was a great deal of disappointment in World's Fair circles, last week, when it was announced that Mexico had appropriated but $50,000 for an exhibit of that country at the World's Fair. The disappointment arose largely over the fact that it had been announced by Commissioner H. B. Payne that Mexico would appropriate $750,000. This was drop of 1400 per cent. on the commissioner's estimate, and the committee on foreign exhibits, which at its meeting received the information, was almost dumfounded.—[Farm Implement News. In other words, Mexico's appropriation is fourteen times less than nothing!

The Ohio Board of World's Fair Commissioners is planning for real and practical results. It proposes to prepare a map of the State showing the variety and location of various soils. A complete show of agricultural products will be obtained by supplementing the premiums offered at the State Fair, with the condition that they shall become the property of the State Commission. It is the intention to supplement the Exposition cash premiums for live stock by others offered by the State. All of the 320 or more varieties of birds in the State will be shown mounted by taxidermy. In numerous other branches the Commission is working to secure a notable exhibit.

The South Park Commissioners have taken steps to have Drexel, Grand and Oakwood boulevards, leading to the Exposition grounds, brilliantly lighted with electricity. An electric plant costing $75,000 to $100,000, and equal to supplying 300 arc lights, will be established. The Exposition authorities will illuminate with electricity the entire Exposition grounds, including Midway Plaisance. More than three times as much power will be required to run the dynamos as was used in all the departments of the Philadelphia Centennial show. Although the estimates have not been finished, the engineers have already provided for 20,000 arc lamps and fully 100,000 incandescent lamps. Twelve thousand of the latter will be used in the Fine Art Galleries alone.

Of course the report that exhibits at the World's Fair coming from foreign countries were to be marked with their labor cost in those countries was not generally believed, as the scheme would evidently be entirely impracticable. But on some accounts it is to be regretted that it could not be done. Such an exhibit would be a wonderful educator, and in our opinion would show that our American labor, using our American machines and methods of manufacture, can and does produce most lines of manufactured goods at lower cost than they are produced anywhere else in the world. And we believe, too, that such an exhibition held ten years hence would show us to be still further in advance, for as automatic machinery comes more and more into use in manufacturing, the rate of wages per day will be less and less important, so far as labor cost of goods is concerned, and Americans, adapting themselves to the use of such machinery more readily than any other people, will continue to have the advantage in the use of it.—[American Machinist.

Disadvantages of Nickel Steel.

The recent remarkable discovery of the effect of temperature on the density of nickel steel is likely to have an important bearing on its use in the construction of war vessels. After this variety of steel has been frozen it is readily magnetized, and, moreover, its density is permanently reduced fully two per cent. by the exposure to the cold. It is stated that a ship-of-war built in the temperate climate of ordinary steel and, clad with say 3,000 tons of nickel steel armor, would be destroyed by a visit to the Arctic regions, owing to the contraction of steel by the extreme low temperature. The experiments made were with compound armor plates faced with 25 per cent. nickel steel, and it remains to be seen whether a similar or lessened effect would be produced on steel containing from five to seven per cent. of nickel.—[Philadelphia Record.

THE HACKNEY HAMMER CO.
OF CLEVELAND, OHIO,
MANUFACTURE THE MOST SUCCESSFUL
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THAT HAS YET BEEN OFFERED TO THE TRADE,
THOROUGHLY PRACTICALLY TESTED FOR TWO YEARS
BEFORE BEING PUT ON THE MARKET.
NOW ENDORSED BY SOME OF
THE BEST FIRMS IN THE COUNTRY.
WRITE FOR CATALOGUE AND ALL INFORMATION.

INDUSTRIAL SUMMARY.

New Enterprises:—

A foundry and machine shop will be erected at Flatonia, Tex., by E. P. Hanland.

W. H. Francks and S. F. Raspberry will erect a foundry and machine shop, at Newberne, N. C.

The Aluminum Alloy Metal Co., of Hampton, Ia., has been incorporated, with a capital of $25,000.

Brightman & Collins, of Cleveland, will erect a machine shop, to be 58x103 feet, two stories, and built of brick.

The James Stewart Manufacturing Co. has begun the construction of its extensive foundry and stove works at Woodstock, Ont.

J. A. Cornish, of Arkansas, will establish in Pittsburgh, Tex., an iron foundry for the manufacture of his patent grate bars and fire-backs.

The Brush estate, of Detroit, Mich., have prepared plans for a foundry and machine shop, to be of brick, 41x91 feet, three stories, and to cost $8,000.

The organization at Charleston, W. Va., of a stock company, for the purpose of manufacturing the self-locking nut patented by A. W. Ward, is talked of.

John F. Pollock, James M. Lohring and Charles A. Lohring have incorporated the Acme Motor & Machine Co., of East St. Louis. The capital stock is $500,000.

The C. H. Woodruff Co. will operate a foundry at Elgin, with a capital stock of $60,000; incorporators, Charles H. Woodruff, Julius Clarke Daniels and W. E. Bosworth.

The Paragon Manufacturing Co. has been incorporated at New Haven, Conn., with a capital stock of $16,000. The company will manufacture hardware, tools and specialties.

An engineer corps recently appeared at Mendelssohn, a new town on the Monongahela river, and staked off a tract which report says will be occupied by tinplate works.—[American Manufacturer.

A company has been organized at Birmingham, Ala., by Isaac P. Gilbert, of Michigan, with a capital of $1,750,000, to be known as the Mammoth Manufacturing Co., for the manufacture of agricultural implements.

The Connell & Dengler Machine Co., capitalized at $100,000, has been incorporated, at Rochester, N.Y. The object of the company is to manufacture and sell machinery and machinery supplies, and to operate a foundry.

It is reported that H. Simon and others have purchased 1,000 acres of land, near Birmingham, Ala., and will establish a town to be known as Shadeville. It is said that the company will construct an iron furnace and establish other industries.

The Allentown (Pa.) Hardware Works, with a capital of $80,000 has been granted a charter. The directors are John Bowen, Andrew S. Keck, Joseph Ruhe, Joseph Downing, W. H. Ruhe, H. K. Hartman and William Roth; Treasurer, James P. Barnes.

John Q. A. Houghton, of Baltimore, Md., and others, have incorporated, at Harper's Ferry, W. Va., the Houghton Machine Manufacturing Co., to manufacture the patent button-hole machine of John Q. A. Houghton. The capital stock is $10,000, with privilege of increasing to $500,000.

The Damascus Steel Co., at Denver, Colo., has been formed, for the manufacture of steel and steel tools, under certain patents. The capital stock is placed at $1,000,000. S. P. Rose, G. Z. Dimmit, C. G. Hathaway, T. J. Cooper, J. S. Mosby, Jr., and L. D. York are the directors of the company.

John S May, Philip Engelskirger, E. E. Hughes and others have incorporated the Souder Railway Freight Car Co., at Newport, Ky., for the purpose of manufacturing all kinds of freight cars for railways, according to the patents of Jacob J. Souder, of Washington, D. C. The capital stock is $2,000,000.

Additions, Enlargements, Removals, etc.:—

The Coburn Trolly Truck Co., will erect a new factory near Holyoke, Mass.

The Texas & Pacific Railroad Co. will erect a repair shop in El Paso, Texas.

An addition, 48x100 feet, is being erected at the works of C. John Reily, Pittsburgh, Pa.

The American Foundry Co., of Edison, Wash., is to erect a plant for the manufacture of car wheels.

The Dominion Barb Wire Works Co, of Montreal, Can., will establish a branch factory at Winnepeg, Man.

The Steam Heater Co. of Susquehanna, Pa., is talking of erecting a new and larger machine shop next season.

The Hoyt Metal Co., of St. Louis, Mo., have completed a new factory at Arlington, N. J., which they will shortly occupy.

The Lincoln Iron Works, Rutland, Vt., are making additions to their property preparatory to increasing their business.

The Damon Safe & Iron Works Co., which was recently partially burned out at Cambridgeport, Mass., is contemplating starting a branch factory in the West, instead of rebuilding.

THE STIRLING COMPANY
MANUFACTURE
The Safest, Most Economical, Compact and Durable High Pressure
WATER TUBE BOILERS
All Wrought Steel. Large Mud Drum. Perfect Circulation.
By removing four manhole covers access is gained to every part of the boiler.
Dry steam and great economy of fuel guaranteed.
GENERAL OFFICE: Pullman Bldg., Chicago. PITTSBURGH OFFICE: Lewis Block. NEW YORK OFFICE 74 Cortlandt St.
Works: BARBERTON, SUMMIT COUNTY, OHIO.

The Carson French Machine Co., of Boston, are to build a factory at Charlestown, 22x115 feet, with wing for boiler house.

The Porter Machine Co., of Newark, N. J., are erecting an addition to their works 100x65 feet in size and three stories in height.

The St. Louis Screw Co. is preparing plans for a new factory. The property was purchased some time ago, and is 150x140 feet.

The Courtwright Manufacturing Co., makers of railroad supplies, will remove their factory from Detroit to Benton Harbor, Mich.

The Jenifer Iron Co. at Jenifer, Ala., have been perfecting plans for a cotton tie factory when they contemplate erecting at that place.

Creswell's iron foundry, Philadelphia, is to be removed to a new site, where a two-story brick structure, 190x70 feet, is being erected.

It is stated that the Southern Steel Co. will greatly enlarge its department for the making of steel by the Bessemer-basic process, at Chattanooga, Tenn., erecting two 10-ton converters.

The plant of the Jones Car Co., at West Troy, N. Y., is to be increased by a large addition. This will double the capacity of the works, which are now overtaxed. The new plant will be in readiness for use by next Spring.

The Leavitt Machine Co., of Orange, Mass., has decided to build an addition to its shop at once, and build an office outside the shop. The business has increased about 50 per cent. within three months, and outgrown the present quarters.

The contract for the erection of a foundry for the Berlin Machine Works, at Beloit, Wis., has been let to the Northwestern Contracting Co., of Chicago. Plans also are being prepared for a foundry for the Eclipse Clutch Works, at the same place. It will be 85 feet by 90 feet.

The Robb Engineering Co., Amherst, N. S., is applying for incorporation, with a capital stock of $249,000, for the purpose of enlarging the business heretofore conducted by A. Robb & Son, in iron and brass founding and general engineering, and the manufacture of all kinds of machinery, engines, boilers, etc.

The Cincinnati Corrugating Co., of Piqua, O., are building an addition to their works for the announced purpose of making 'bright or terne" tinplates of the highest grade. For this purpose they have ordered one pair cold rolls from A. Garrison & Co., Pittsburgh; six annealing boxes from McKeesport (Pa.) Machine Co.; four Morewood tinning pots; one five-roll Morewood tinning machine; one pump for liquid tin; complete kits of tinman's and washman's tools; shaftings, pulleys, fire and red brick, cement, lime, castings, bolts, etc., to erect a complete tinning "stack." The steel sheets are to be rolled by the Piqua Rolling Mill Co.

Fires and Accidents:—

The factory of the Dehill Carriage Hardware Co., at Anderson, Ind., employing 150 men, was totally destroyed by fire. The loss is heavy.

The factory of the Acme Railway Signal & Manufacturing Co., at Galesburg, Ill., has been burned to the ground. The loss is $30,000, covered with $20,000 insurance.

General Industrial Notes:—

The Jeffrey Manufacturing Co., Columbus, O., have opened a branch office at No. 15 Cortlandt street, New York, with Mr. F. C. Ayers in charge.

The necessary excavating has been commenced for the foundations of the new Bessemer steel plant to be erected by the Shenango Valley Steel Co., at New Castle, Pa. As already stated, the plant will be erected by the Pittsburgh Iron & Steel Engineering Co., of Pittsburgh.

The Alabama Rolling Mill Co., Birmingham, Ala., write that they have rebuilt the portion of their mill recently destroyed by fire, and completed improvements and additions that will increase their production to 75 tons per day. They say that their entire plant is now in full operation, and that they can promise prompt and satisfactory shipments.

The Connell & Dengler Machine Co., at Rochester, N. Y., have been incorporated, and will continue the business of Connell & Dengler, who have been manufacturing a fine line of woodworking machinery for a number of years. The officers of the company are John Connell, President; Valentine Dengler, Treasurer and W. C. Burnette, Secretary.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until two o'clock, P. M, on the 16th day of December, 1891, for all the labor and materials required to fix in place complete, the low-pressure, return-circulation, steam-heating and ventilating apparatus, for the United States Court House and Postoffice building, at Texarkana, Ark.,

The Edgar Thomson Steel Works, of Carnegie Bros. & Co., Limited, at

Bessemer, Pa., has eclipsed all previous records for production. For the 24 hours ending on Friday morning, the 13th inst., at six o'clock, there was produced in the above plant 1,907 gross tons of finished rails, No. 1 turn making 3,022 rails, equal to 932 tons, and No. 2 turn making 3,173 rails, equal to 975. During the same period the converting department turned out 2,070 tons of ingots.

An interesting experiment was tried on the 9th inst., at the Milwaukee works of the Illinois Steel Co. The attempt was made to roll thin steel sheets on the nail-plate train, which has been standing idle for several years. Some 500 pounds of No. 30 sheets were turned out, which proved to be smooth, even and of very good quality. They were taken to Chicago to be tinned. The officers of the company are reticent regarding their intentions, but the expectation is entertained that the success of the experiment may lead to the manufacture of tinplate at this plant. The rolls are narrower than the usual tinplate rolls, but they can be widened without much difficulty.

The Supreme Court of the United States has handed down an opinion in the case of the Lake Superior Iron Co., against Brown, Bonnell & Co. and others, a proceeding in error on exceptions to the opinion of the Honorable Augustus J. Ricks, district judge of the Northern District of Ohio. The Supreme Court, by the decision, confirms and approves the decision of Judge Ricks. Now that the United States Supreme Court has finally ended the litigation, it is believed that the syndicate which purchased all the plants of Brown, Bonnell & Co. will take possession of the same and operate them. It is stated that a plan has already been proposed to reorganize the corporation of Brown, Bonnell & Co. It is the purpose of those interested for the creditors to take stock in the concern to the extent of their claim, and those who do not desire to do this will probably be paid on satisfactory terms.

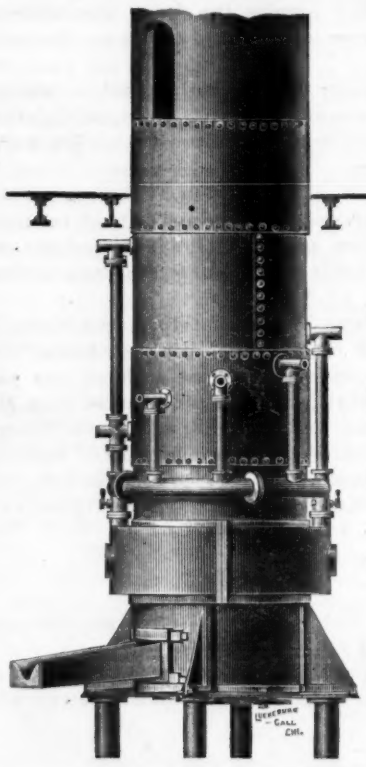
THE STERLING GRATE-BAR COMPANY,

—MANUFACTURERS OF—

The Celebrated Sterling Grate-Bar.

The most economical, the most durable and the easiest of management. Made of cast iron or annealed cast steel, either stationary or with shaking attachment. Prices quoted on all kinds of bars. General offices,

SOCIETY FOR SAVINGS BUILDING, - - CLEVELAND, O.



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CUPOLA.

15 to 50 Per Cent. Saving in Fuel,

With Corresponding Increase in Quality of Iron Melted, Over any Existing Cupola.

15 Per Cent Saving Guaranteed.

Can be Applied to any Type of Cupola Now in Use.

400 IN USE IN EUROPE.
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AGENTS WANTED.

UNGER AND WIGHAM,

301 Phenix Building, Chicago.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g,
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and cheapest Paint made.

FURNISHED both Dry and Ground in Oil.

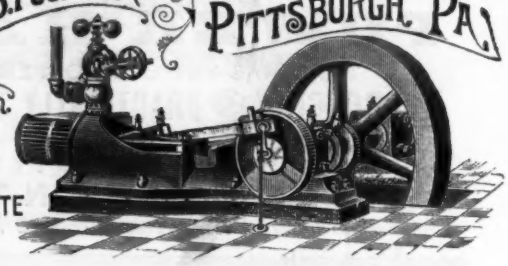
USED BY NEARLY ALL THE RAILROADS

POSITION WANTED.

A founder, who has had 29 years' experience, wants position where he can have charge of one furnace, or two if close together. Understands the business thoroughly and can give the best of references. Address **Founder,**
Care of "IRON TRADE REVIEW," Cleveland, O.

THE AETNA MEDIUM & HIGH SPEED ENGINE

Manufactured by THE TOTTEN & HOGG I. & S. FOUNDRY Co. PITTSBURGH, PA.



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FOR ROLLING MILLS AND ALL OTHER WORKS WHERE LARGE POWER AND CLOSE REGULATION IS REQUIRED

CONTRACTS MADE FOR COMPLETE STEAM PLANTS.
ENGINES ALWAYS IN STOCK.

HAS YOUR WAREROOM

BEEN ROBBED?

Our corrugated or plain Iron or Steel **SHUTTERS** and **DOORS** will render it Fire and Burglar Proof. We also cover wooden shutters and doors with flat painted sheets, either plain or with corduroy corrugations. For prices, etc., address

The Cincinnati Corrugating Company,

BOX 320. **PIQUA, O.**

AMERICAN BRIDGE AND IRON CO.,

Roanoke, - - Va.,

Designers and Builders of

IRON AND STEEL BRIDGES AND VIADUCTS FOR HIGHWAYS AND RAILROADS,

Iron Furnace Plants, Stand Pipes, Mine Car Irons and Wheels,

Also Machinists and Founders. ENGINEERS: C. C. Wentworth and Jos. L. Hunter.

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PATENTS

A pamphlet of information and abstract of the laws, showing How to Obtain Patents, Caveats, Trade Marks, Copyrights, *sent free.* Address MUNN & CO. 361 Broadway, New York.

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TO ESTABLISH YOURSELF IN A

Good Paying Business.

I have for sale a small MACHINE SHOP with good Tools, now manufacturing specialties and a good jobbing trade offered. LOW RENT. Can work into a big business. Call on or address

JAMES JENKS.

Dealer in Machinery, DETROIT, MICH.

MICHIGAN

EMERY WHEEL CO.

194 Catherine St., Detroit, Mich.

Solid Emery & Corundum Wheels, to Run Wet or Dry, Special Shapes.

Perfection Saw Gummers.

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To Advertisers

If you wish to advertise

and need instruction, send one dollar for our "Book for Advertisers." A little study of that book will enable you to decide what you ought to do, and give an idea of the probable cost.

If you instruct us

to place a certain amount of advertising for you in the way we think will do you the most good, you should send an explicit statement of what you wish to accomplish, and make suitable arrangements for payment. Your order will then receive all the attention that it requires.

If you wish an advertisement

prepared and a plan of advertising marked out; to be told what papers you should use, and what the cost will be, we will furnish the advertisement and the plan—either or both, and submit them for your consideration, together with our bill for the service.

For preparing advertisements,

electrotypes and estimates the advertiser pays us. For the expense of placing advertisements and watching the fulfillment of contracts we are paid by a commission allowed by the publisher of the paper in which the advertisement appears.

If you want to learn

all the ins and outs of advertising without any cost or trouble, read PRINTERS' INK regularly, carefully, studiously; issued weekly, $2 a year.

If you wish a complete catalogue of all newspapers, send $5 for the American Newspaper Directory.

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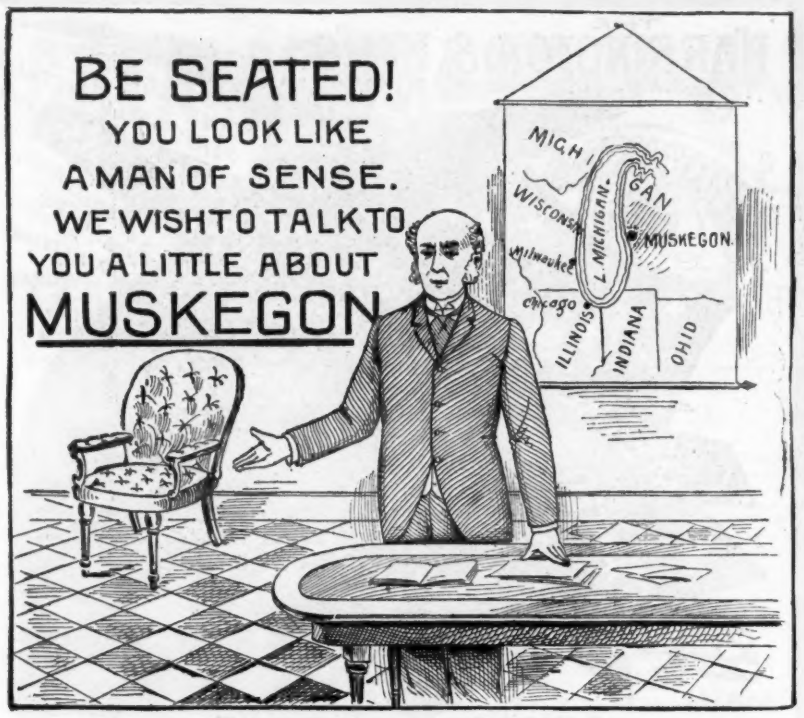


I wish to say to you that for the Manufacturer or Investor

THE CITY OF MUSKEGON, MICH.,

offers greater opportunities, has more real merit than ANY young City of the United States.

I AM aware that this is a BOLD STATEMENT, but I am prepared to give **Facts and Figures that will astonish you.** Notice this map on the wall, the Lake Michigan District, four States, having a common center (Lake Michigan). These four States, bordering on the **only** great body of water lying **wholly** within the United States, have an average age as States—61 years—and no district of the world ever made such a **record.** These four States: Illinois, Indiana, Michigan and Wisconsin, had, by the census of 1890, 9,781,255 population, or nearly **one-sixth** of the entire population of the Union; they have over **one-fifth** of the railway mileage of the United States, and over **one-tenth** of the railway mileage of the world; and talk about rapid growth—**Look at this table:**

NAME OF STATE.	GAIN LAST 30 YEARS.	PRESENT POPULATION—1890.
ILLINOIS	2,106,585	3,818,536
INDIANA	1,514,117	2,189,030
MICHIGAN	1,340,679	2,089,792
WISCONSIN	907,016	1,683 897
TOTAL	5,868,397	9,781,255

This 30 years gain—5,868,397—is MORE than the present ENTIRE POPULATION of the following FIFTEEN STATES, viz:

NOTE:—

MICHIGAN, which is twenty years younger than Illinois or Indiana, made nearly

23 PER CENT.

of the entire gain of this four-state district for the last thirty years.

THE FOUR-STATE GAIN WAS 5,868,397.

The present population of this four-state district is 9,781,255 or MORE than the 22 opposite: ☞

See U. S. Census 1890.

1	California	1,204,002
2	Colorado	410,975
3	Connecticut	745,861
4	Maine	660,251
5	Vermont	332,205
6	New Hampshire	375,227
7	Rhode Island	345,343
8	Delaware	167,861
9	Montana	131,769
10	Nevada	44,327
11	Washington	349,516
12	Utah	206,498
13	Oregon	312,490
14	North Dakota	182,425
15	South Dakota	327,848
	Total	5,796,598
16	West Virginia	760,448
17	Maryland	1,040,431
18	Florida	390,435
19	Idaho	84,229
20	New Jersey	1,441,017
21	Wyoming	60,589
22	New Mexico	144,862
	Total	9,718,609

NOTE.—Michigan gained more population in the last **30** years—see table above—than the present entire population of Connecticut, Vermont and Delaware combined, or within 5,000 as much population as Oregon, Washington, Colorado, Montana and Nevada have combined.

NOTE.—Michigan gained more population in the last **10** years than **Virginia and Georgia** together gained, or than **Kentucky and Tennessee,** or **Alabama and Mississippi** combined gained.

YOU ARE SURPRISED AT THIS.

It was your impression that all the growth and wealth of this district was at the south end of Lake Michigan, but let me tell you right here that the great intrinsic wealth is farther north, in the Iron, Copper, Salt and Timber district. The hardwood forests have scarcely been touched. Michigan puts out yearly over half the Iron Ore mined in the United States; more than all the Southern States combined. Nearly every pound of Steel made in Pennsylvania and Ohio is made from Ore coming from this district, (96.3 per cent of the Steel output of the United States for 1890 is accredited to six States lying along the **Great Lakes**) and this output was 100,000 tons more than that of Great Britain for 1889—**MICHIGAN FURNISHED THE ORE.**

When You Have Absorbed

THE

FOREGOING FACTS AND FIGURES

You are beginning to reach a point where you will appreciate the location of the City of

MUSKEGON.

Notice on this Map on the wall, and in the Cut below,

MUSKEGON'S CENTRAL LOCATION

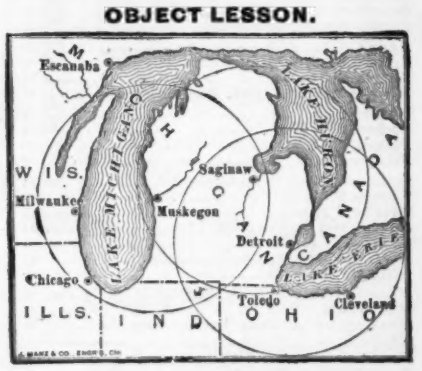
IN THIS GREAT

TEN MILLION POPULATION DISTRICT.

IT HAS THE BEST LOCATION IN MICHIGAN.

LOOK AT THIS!

OBJECT LESSON.



3 MICHIGAN CIRCLES.
NAVIGATION CITIES.

Radius of Each Circle, 125 Miles.

POPULATION:—Each Circle has in round numbers in United States population as follows:

SAGINAW CIRCLE, - -	1,725,000
DETROIT CIRCLE, - - -	2,600,000
MUSKEGON CIRCLE, - -	2,725,000

NOTE.—See Cram's Atlas, Census 1890, by Counties.

The great business centers of this Lake Michigan District are the Coast Cities. **Muskegon** is third in size on this great body of water and has the finest natural inside Harbor on Lake Michigan, sixteen miles of water front, all available, deep water—114 miles from Chicago and 85 miles from Milwaukee, with which two cities **navigation is open the year round.** Only 175 miles by navigation from the greatest **Bessemer Ore** shipping docks in the **world.** Rare combination—**Raw Materials, Best Shipping Facilities and Best Markets** in the United States.

IT IS AN ACTUAL FACT that cargoes of heavy merchandise can be carried from **Muskegon** to the business center of **Chicago quicker** and for **less money** than the same quantity can be brought in **by rail** from points 10 to 15 miles outside the limits of Chicago. No experiment. Doing it now.

These great advantages are beginning to be appreciated. Twenty-one factories have been located in the last eighteen months. Among the factories secured are: **The Alaska Refrigerator Co., Large Rolling Mill, New Steel Works, Chase Bros. Piano Co., Sargeant's Invalid Chair Co., Nelson Piano Co., Mich. Washing Mach. Co., Malleable Iron Works, Machine and Foundry Co., Electric Alarm Co., Shaw Electric Crane Co., Houck Furniture Co., Electrical Power Co., Muskegon Cracker Co., Standard Oil Co. Barreling Works, Morton Key Seating Co., Kelly Bros. Mfg. Co., Heaps Earth Closet Co., Gray Bros. Mfg. Co., Hartshorn Shade Roller Co., New Flouring Mill**—All just completed or now building.

Why do you "CHASE RAINBOWS" on the outskirts of the Country, and invest at high prices, when you can get property near the great business center of the "Central West" for half the money, and having double the intrinsic worth?

A GOLDEN OPPORTUNITY IS BEFORE YOU.

THE MUSKEGON IMPROVEMENT CO., composed of leading citizens, have just commenced their **2nd Great Lot Sale. 2,000 Lots** at the uniform price of **$165 each,** location to be determined by allotment as soon as 50 per. cent. is paid in. **Terms of Subscription:** $15 down, balance $10 each month. $165 secures you a good lot, 50x125 feet, with alley in rear, in the phenomenal addition **"MUSKEGON HEIGHTS,"** which addition is pronounced by Real Estate Experts to be as fine an addition as any city in this country can show. It is less than one and one-half miles from the business center of the City of Muskegon, with which it is connected by handsome, paved streets and an Electric Street Railway. This addition has twelve **large** factories located upon it **now;** has good Hotel, Brick Blocks and Stores, Depot, three paved streets, a large number of good residences. Every lot is level and desirable. **There is not a lot on the addition worth less than the price asked.** The net avails of this sale to be used to locate ten more factories. All the factories on Muskegon Heights are solid, substantial brick structures, the smallest is 50x150 feet, 2 stories; the largest plant is two buildings, each 60x400, one 2 stories, the other 3 stories high; the latter plant is owned by four Bank Presidents and is the largest factory of its kind in the world. **DON'T MISS THIS OPPORTUNITY. Such chances for sure paying investment are rare.**

If you wish to subscribe, remit by Money Order, P. O. or Express, or Bank Draft, to

F. H. HOLBROOK, Sec'y Board of Trade, or

HOLBROOK & McDONALD, SALES AGTS.,

MUSKEGON IMPROVEMENT CO.

REFERENCES: Any Bank in the City of Muskegon. Send for Maps, Plats and Information.

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Jones, E. H. & Co	22
Jeffrey Mfg. Co	18
Jenks, James	14
Kanneberg Roofing Co	23
*Leffel, Jas. & Co	23—
Lancaster, James H	21
*Long Steel & Iron Roofing Co	23
*Leffel Water Wheel & Engine Co	—
Murdock, James, Jr	20
Milton Mfg. Co	16
*Munn & Co	14
*McCombs, C. E	—
Michigan Emery Wheel Co	14
*Neracher Sprinkler Co	—
New Philadelphia Iron & Steel Co	16
*Niles Iron & Steel Roofing Co	—
Outhwaite, J. H. & Co	17
Oglebay, Norton & Co	17
Oldfield, L. H	20
Pope, E. C	17
Parkin & Bosworth Co	24
Palmer, Cunningham & Co	18
Pittsburgh & Wheeling Coal Co	17
Penberthy Injector Co	24
Pollock, Wm. B. & Co	22
Rogers & Hubbard Co	18
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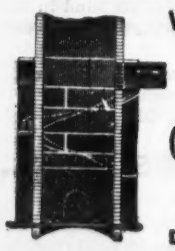
Schleicher, Schumm & Co	22
Sykes Iron Roofing Co	23
Sackman, F. A	18
Southwark Foundry & Machine Co	23
Stirling Co	13
Stilwell & Bierce Mfg. Co	24
Spicer Mfg. Co	16
Shepard, H. L., Agent	20
Spaulding & Metcalf	19
Skinner Engine Co	23
Stevens, F. B	23
Satterthwaite, M. P	19
*Simpson, Thos. P	—
Sterling Grate-Bar Co	14
Toledo Machine & Tool Co	22
Tod, Wm. & Co	22
Totten & Hogg Iron & Steel Foundry Co	14
Van Duzen Gas Engine Co	21
Upson Nut Co	20
Union Electrotype Foundry	18
Universal Radial Drill Co	24
Unger & Wigham	14
Union Photo Engraving Co	23
Webster, Warren & Co	24
Webster, Camp & Lane Machine Co	18
West, Thos. D. Foundry Co	18
Westinghouse Machine Co	23
Wyckoff, Seamans & Benedict	16



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IRON & STEEL SHEETS

of superior quality and finish.

Cold-Rolled Smooth Finished.

Our Cold-Rolled Smooth Finished material is giving excellent satisfaction to the trade. The iron makes a handsome, finely finished stove-pipe, and the steel, elegant elbows. This material is also used for a variety of other purposes where nice finish is an object.

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We are producing a specially good quality of Roofing Material of all kinds. Our Steel standing seam quality is flat and smooth and when laid looks as well as a tin roof. All standing seam quality sheared on Squaring Shears.

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We have five sheets mills producing one thousand tons per month and can invariably fill orders with reasonable promptness. We make all gauges from No. 10 to No. 30, and can roll to 36 in. wide. Inquiries will receive careful and prompt attention and we solicit your correspondence. Visitors are always welcome and accorded courteous treatment.

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New Philadelphia Iron & Steel COMPANY,

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THE REMINGTON STANDARD TYPEWRITER

Is to-day, as it has ever been, the leading Typewriter.

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TRY OUR PARAGON BRAND OF TYPEWRITER RIBBONS.

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IF you wish to advertise anything anywhere at any time write to GEO. P. ROWELL & CO., No. 10 Spruce St., New York.

EVERY one in need of information on the subject of advertising will do well to obtain a copy of "Book for Advertisers," 368 pages, price one dollar. Mailed, postage paid, on receipt of price. Contains a careful compilation from the American Newspaper Directory of all the best papers and class journals; gives the circulation rating of every one, and a good deal of information about rates and other matters pertaining to the business of advertising. Address ROWELL'S ADVERTISING BUREAU, 10 Spruce St., N. Y.

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General Foundry and Machine Work, Heavy and Light Castings.

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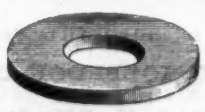

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Even in Gauge, smooth and well finished.

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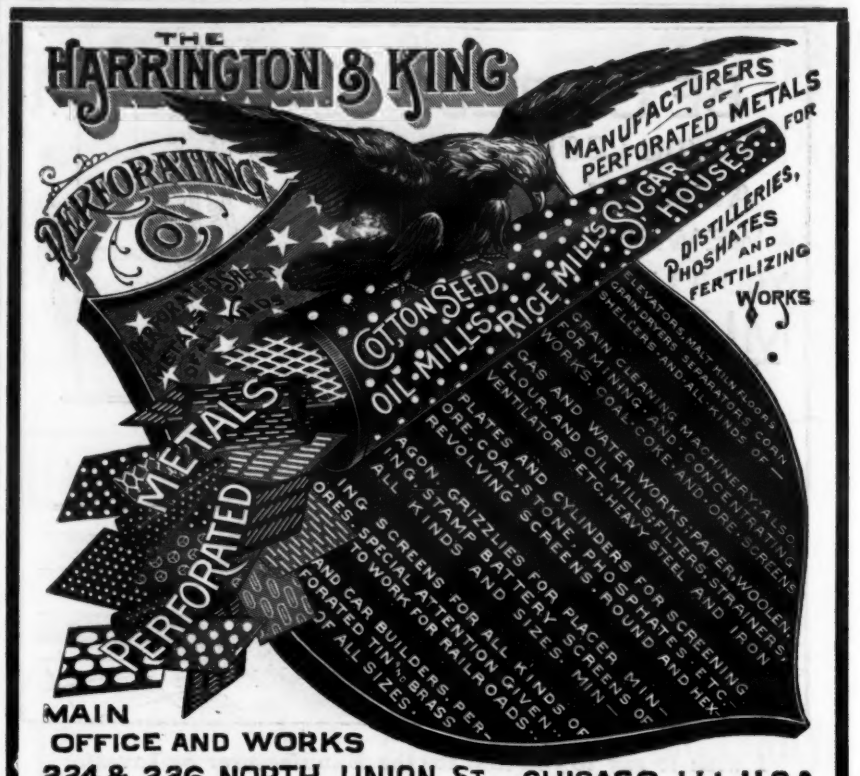
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Ruled to any pattern.

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Cleveland, Ohio.

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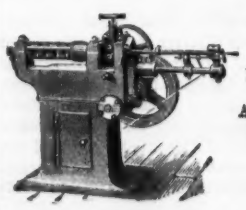

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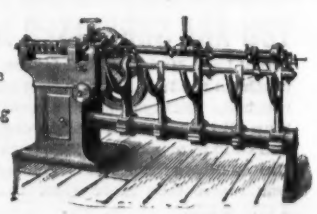
New Haven, Conn.

Builders of Machinery for Hardware Manufacture.

Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Sprue Cutters, Etc.



CATALOGUES

Printed in the Highest Style of Art, by
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Cleveland, O.

CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

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Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel. Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, net cash) Bessemer, $17 30; No. 1 Foundry, $16 80; No. 2 Foundry, $15 80; No. 1 Gray Forge, red short, $14 80; No. 2 Gray Forge, neutral, $14 30; No. 1 American Scotch, $16 80; No. 2 American Scotch, $15 80.

CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1. foundry, $16 25@17 00; Southern Coke No. 2 Foundry, $15 25@16 00; Southern Coke No. 3 Foundry, $14 75@15 50; Southern Coke No 1, Softeners, $15 25@16 00; Southern Coke No. 2, Softeners, $14 50@15 25; Ohio Silveries No. 1, $17 50@18 50; Ohio Silveries No. 2, $16 50@ 17 50; Ohio Strong Softeners No. 1, $18 00@19 00; Ohio Strong Softeners No. 2, $17 25@18 25; Lake Superior Charcoal Nos. 1 to 6, $17 75@18 50; Tennessee Charcoal No. 1, $18 00@19 00; Tennessee Charcoal No. 2, $17 00@18 00; Southern Standard Car Wheel, $21 00@23 00; Tennessee Standard Car Wheel, $00 00@00 00.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 00@15 50; Southern coke, No. 2 and No. 1 soft, $14 00@$14 25; Hanging Rock Coke, No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 00; Tennessee Charcoal, No. 1 foundry, $17 00@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $12 75@13 00; Standard Southern Coke, mottled, $12 50@12 75; Cold Short Southern Coke, grey forge, $12 75@13 00; Strong Ohio Neutral Coke, grey forge, $15 00@15 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $19 50@20 50; Tennessee Car Wheel, $18 00@19 00; Lake Superior Car Wheel, $19 50@20 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $16 00@17 50; Mahoning and Shenango Valley strong, No. 2 Foundry, $15 00@16 50; Ohio Softener No. 1, $16 25@16 75; Ohio Softener No. 2, $15 25@15 75; Jackson Co., Silvery No. 1, $18 00@00 00; Jackson Co. Silvery, No. 2, $17 00@00 00; Lake Superior Charcoal, $18 50@00 00; Tennessee Charcoal, $18 00@19 00; Southern Softener No. 1, $16 25@00 00; Southern Softener No. 2, $15 50@15 75; Southern Strong No. 1 Foundry, $16 75@00 00; Southern Strong No. 2 Foundry, $16 25@00 00' Alabama Car Wheel, $19 75@21 75; Hanging Rock Charcoal, $21 00@22 00.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $14 25@14 50; Southern coke No. 2, $13 50@14 00, Southern coke No. 3, $13 00@13 25; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 00@17 00; Southern charcoal, No. 2, $15 50@16 00; Missouri charcoal, No. 1, $17 00@17 50; Missouri charcoal, No. 2, $16 50@17 00. FORGE—Neutral coke, $12 50@12 75; Cold short, $12 25@12 50; Mottled, $11 75@12 00. CAR WHEEL AND MALLEABLE—Southern (standard brands), $19 00@19 50; Southern (other brands), $17 00@18 00; Lake Superior, $20 00@21 00.

ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 50@15 75; Southern Coke No. 2, $14 50@14 75; Southern Coke No. 3 $13 75@14 25; Southern Grey Forge, $13 25@13 50; Southern Charcoal No. 1, $17 25@17 75; Southern Charcoal No. 2, $16 75@1 25; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $19 50@20 00; Southern, $19 50@20 00. CONNELLSVILLE COKE—East St. Louis, $0 00; St. Louis, $5 65.

DETROIT (reported by William F. Jarvis & Co): Lake Superior Charcoal, all Numbers, $18 00@18 50; Lake Superior (coke) Bessemer, $16 50@17 00; Katahdin (Maine charcoal), $00 00@00 00; Lake Superior Coke, Foundry, all ore, $17 50@18 00; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 00@18 50; Southern No. 1 $16 25@16 50; Southern Gray Forge, $14 00@14 50; Jackson County (Ohio) Silvery, $18 25@18 75; Old Car Wheel, $00 00@00 00. Connellsville Coke, $0.00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 00@15 00; Southern Coke No. 2 Foundry $13 75@14 25; Southern Coke No. 3 Foundry $13 25@13 75; Grey Forge, $12 50@12 75; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $18 00@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $15 50@16 00; No. 2 Foundry, $14 50@15 00; Grey Forge, $13 50@13 75; White and Mottled, $13 00@13 25; Warm Blast Charcoal, $18 00@22 00; Cold Blast Charcoal, $22 00@26 00; Bessemer, $15 00@15 25.

MERCHANT IRON AND STEEL.

Flat Bar

1½ to 4 by ⅜ to 1 inch	1 70
4½ to 6 by ¾ to 1 inch	1 55
1½ to 6 by 1⅛ to 2 inch	2 15
1¼ & 1⅜ by ⅜ to ½ inch	1 85
1 & 1¼ by ⅜ to ½ inch	1 95
⅛, ¼ and ⅜ by ⅜ to ½ inch	2 15

Round and Square.

1 to 1⅜ inch	1 75
2 to 2¾ inch	1 95
2¾ to 3¼ inch	2 25
3½ to 4 inch	2 75
4¼ to 4½ inch	3 25
4¾ to 5 inch	3 45

Oval.

⅛ to 1¼ inch	2 15
⅛ to ¼ inch	2 25
⅜	2 55
⅜	2 95

Half Oval and Half Round.

⅛ to 3 inch	2 85
⅛ to 1¼ inch	2 45
⅛ to ¼ inch	3 05
⅜	3 25
½	4 75

Heavy Band.

4 to 6 by ¼ and 5-16 inch	1 55
4 to 12 by ¼ and 5-16 inch	2 05
to ¼ by ¼ and 5-16 inch	2 25
to ½ by ¼ and 5-16 inch	3 75

Hoops.

1¼ to 4, Nos. 13 to 15	2 55
1¼ to 2, Nos. 16 to 18	2 65
1¼ to 2, No. 19	2 75
1¼ to 2, No. 20	2 85
1¼ to 2, No. 21	2 95
1¼ to 2, No. 22	3 05
15-16, I and 1⅛, Nos. 13 to 15	2 75
15-16, I and 1⅛, Nos. 16 to 18	2 85
15-16, I and 1⅛, Nos. 19 and 20	2 95
15-16, I and 1⅛, No. 21	3 05
15-16, I and 1⅛, No. 22	3 15
⅞, Nos. 13 to 15	2 95
⅞, Nos. 16 to 18	3 05
⅞, Nos. 19 and 20	3 15
⅞, No. 21	3 25
⅞, No. 22	3 35
13-16, Nos. 13 to 15	3 15
13-16, Nos. 16 to 18	3 25
13-16, Nos. 19 and 20	3 35
13-16, No. 21	3 45
13-16, No. 22	3 55
¾, Nos. 13 to 15	3 25
¾, Nos. 16 to 18	3 45
¾, Nos. 19 and 20	3 55
¾, No. 21	3 65
¾, No. 22	3 75
11-16, Nos. 13 to 15	3 55
11-16, Nos. 16 to 18	3 65
11-16, Nos. 19 and 20	3 75
11-16, No. 21	3 85
11-16, No. 22	3 95
⅝, Nos. 13 to 15	3 75
⅝, Nos. 16 to 18	3 95
⅝, Nos. 19 and 20	4 05
⅝, No. 21	4 15
⅝, No. 22	4 25
⅝, No. 23	4 45

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 20
1½ to 6 by Nos. 11 and 12	2 30
1 to 1¾ by ⅛ to 3-16 in	2 40
1 to 1¾ by Nos. 11 and 12	2 50
⅛ and 13-16 by ⅛ to 3-16 in	2 70
⅛ and 1 3-16 by Nos. 11 and 12	2 80
⅛ and 11-16 by ⅛ to 3-16 in	3 00
⅛ and 11-16 by Nos. 11 and 12	3 10
⅛ and 9-16 by ⅛ to 3-16 in	3 30
⅛ and 9-16 by Nos. 11 and 12	3 40
¼ by ⅜ to 3-16 in	3 60
¼ by Nos. 11 and 12	3 70

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12	2 80
⅛ inch, " " " 13 and 14	3 00
¼ inch, " " " 11 and 12	3 10
¼ inch, " " " 13 and 14	3 30

Sheet Iron.

No. 10 to 14	2 45
No. 15 to 17	2 55
No. 18 to 21	2 75
No. 22 to 24	2 85
No. 25 to 26	2 95
No. 27	3 25
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 25
C No. 1, " "	2 40
C H No. 1 " "	2 50
C H Flange, " "	3 50
Extra Flange, "	4 00
Solid Fire Box "	4 75

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 25
Shell	2 50
Flange	2 75
Marine Flange	3 00
Fire Box	4 00

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c lb extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1¼c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	08
9-16 to ⅞ in "	08½
7-16 to ⅜ and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅜ to 11-16 and 4⅛	10
⅝ to 6 in	10⅜
¼ to 9-32 and 6⅛ to 7 in	11
3-6 in	13

Flats.

	cts. lbs
2 to 9-16 wide by 2 to ⅜ thick	8

Bessemer and O. H. Steel.

Machinery	base price,	2 35
Tire	"	2 25
Spring	"	2 80
Sleigh Shoe	"	2 50
Toe Calk	"	2 35
Cutter Shoes, tapered and burr.	"	2 75

English Tool Steel.

Jessop's	15½
Hobson's "Best"	15½
" "Choice"	15

Burden Boiler Rivets.

⅜, ½, 11-16 and ⅝ inches diameter	4 00
Bridge ⅜, ½, 11-16 and ⅝ inch diam	4 00

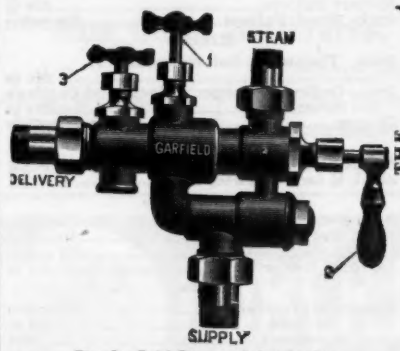
SCRAP IRON AND OLD METAL.

NET TONS	
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	11 50
Iron axles	23 50
Axle turnings	13 50
Wrought turning (free from cast)	11 50
Cast borings	8 00
Uncut wrought iron boilers	11 50
Steel boiler plates	16 00
Grate Bars	8 00
Pipes and flues (Clean)	12 00
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 50
Wrought drillings	11 00
Malleable iron	9 50

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	12 00

THE GARFIELD INJECTOR CO.,



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Exclusive attention given to
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Perry-Payne B'ld'g. Cleveland, O.

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A great saving in mortar, material and labor Write for Catalogue and Sample.
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MAKERS OF
Saws, Tools and Machinery.
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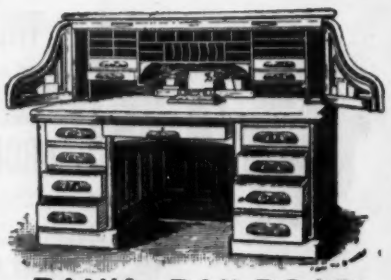
Cleveland, O., U. S. A.

DESKS.



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Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 12

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Blacksmiths' { Hill's.....dis 40 / Bullock's....dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single, ...dis 40
Shults Raw Hide Leather Belting, double and Light Double.....dis 40
Standard, oak tanned.....dis 50&10
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.....dis 35
Buffalo.....dis 25

Borax.

.....₩ lb 12

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¾".....dis 50&10
Morse Taper and Straight shank Larger than 1¾".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to No. 54 46 gr.	150. gr.	F.	FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4¾c	5¾c		3 c
6 lb cans, 10 in case	6 c	6¾c		5 c
6 lb cans, less than 1	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50&10

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	⅜	5-16	½	⅝	¾	⅞	1
Square	8	7	5½	4½	4	2½	2½
Hexagon	15½	11½	8½	6	5½	3½	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1lb boxes add 1c to list.

Nails (wire.

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 40

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15½
Sisal, ½ inch and over.....₩ lb 13½

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 40@10
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 30
Atkins' Cicular Saws.....dis 40&45
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 33c "
No. 1 Handles.....dis 25c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—New List 1890.

Flat head iron.....dis 72½
Round head iron.....dis 67½
Flat head brass.....dis 72½
Round head brass.....dis 65
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅜ lb Balls	21c@29c	
No. 18 " " ¼ and ½ "	18c@28c	
No. 36 " " ¼ and ⅝ "	16c@27c	
2-Ply Hemp, ¼ & ⅜ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12½c	
3-Ply " 1½ lb Balls	11@11½c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 8 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 12 to 14.....dis 75
Stub's Steel Wire, regular.....$6.00 ₩ lb dis 5

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 2
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 25
William's " " .....dis 25
Alligator " " .....dis 50

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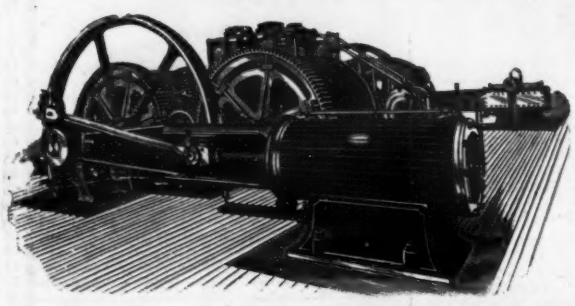

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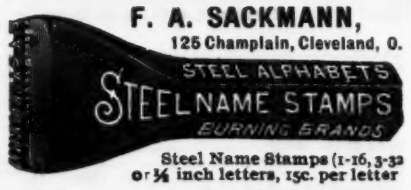

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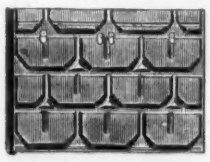

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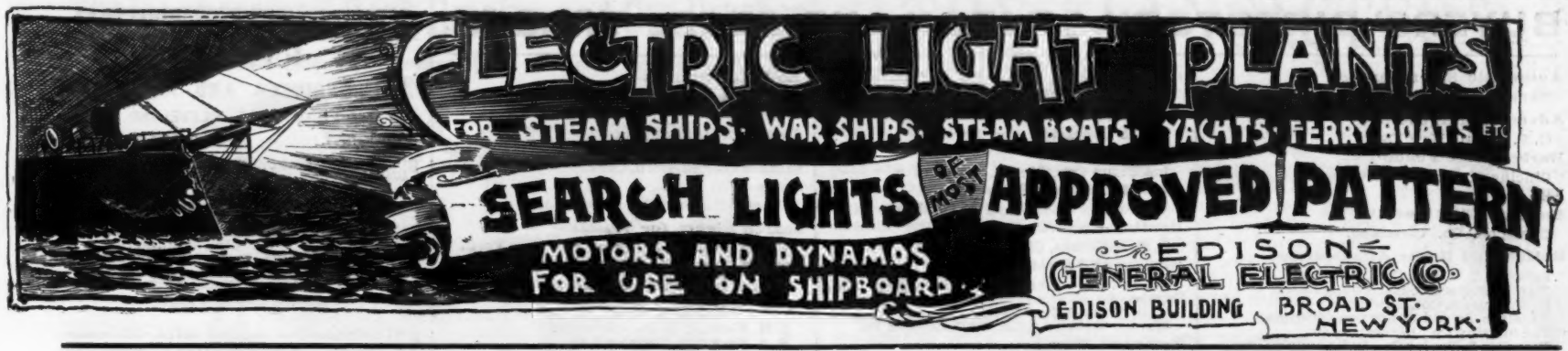
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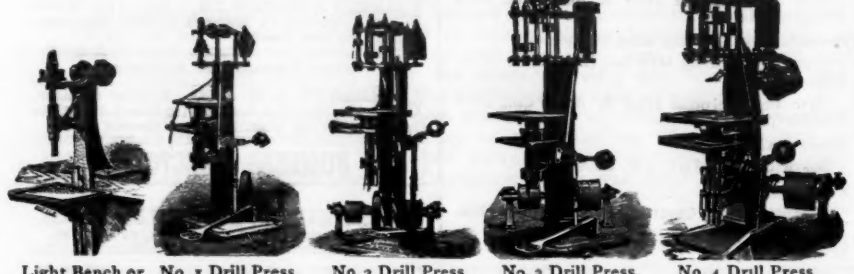

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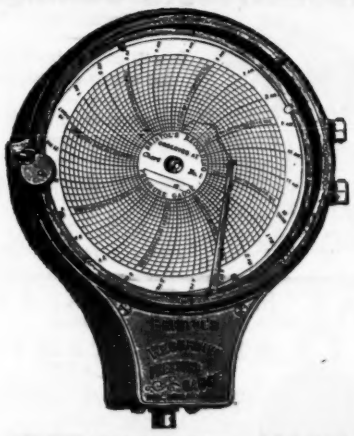

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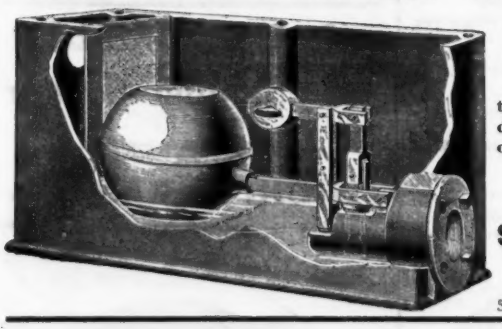

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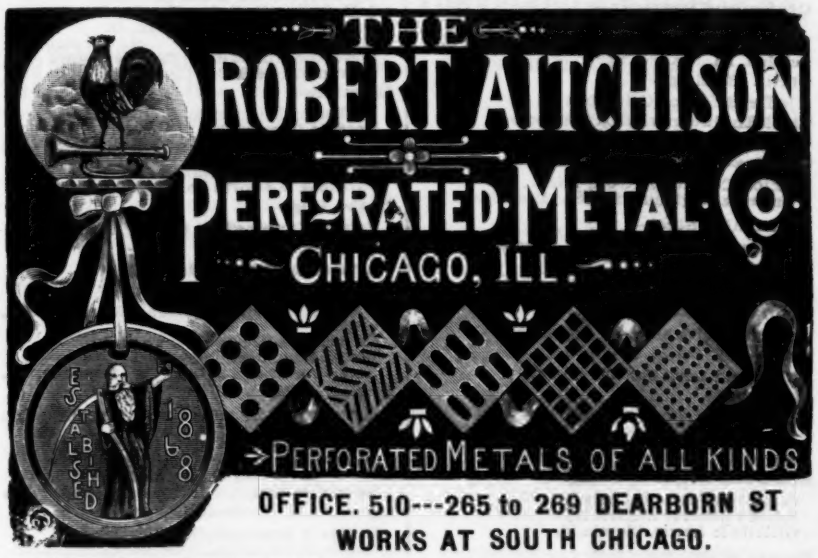

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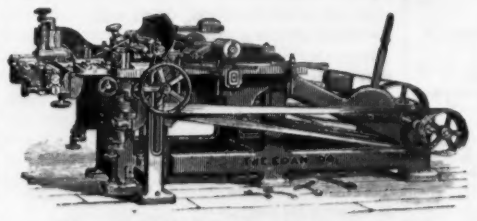

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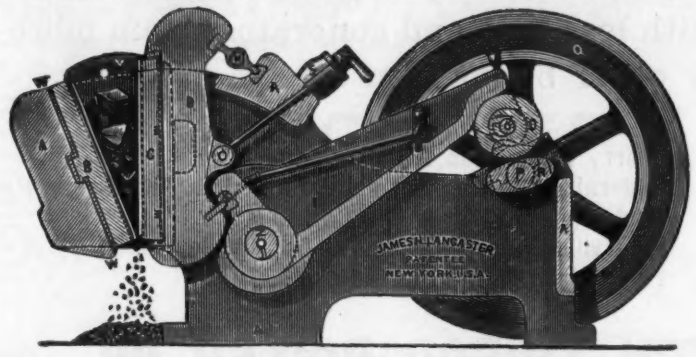

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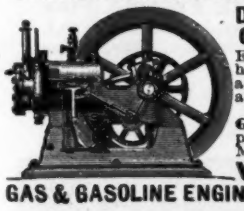

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Mahoning Accommo		†6 40 a m
Pittsburgh Express	†6 25 p m	
Youngstown Local	†8 05 a m	
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Pittsburgh Express	†1 20 p m	11 10 p m
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*Daily. †Daily, except Sunday. ‡Daily except Monday.

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(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m.,6:30 p m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

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Alliance Accom	10 10 a m	3 25 p m
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	d 5 40 p m	d 8 00 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	12 30 p m	1 05 p m
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No. 68, New York & Pitts. Ex	*11 00 p m
	Arrive.
No. 71, N. Y. & Pittsburgh Express	* 7 00 a m
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No. 67, Pittsburgh Accom	*12 20 p m
No. 73, Leavittsburgh Local	2 10 p m
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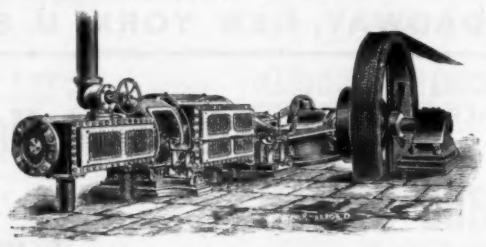

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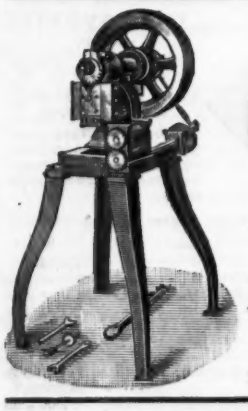

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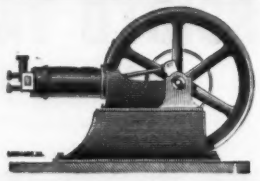

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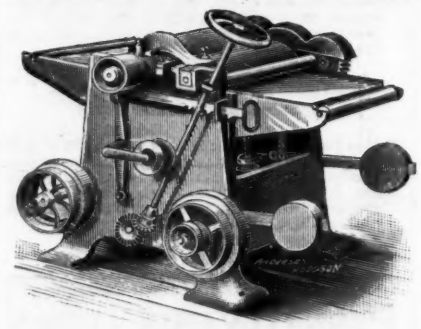

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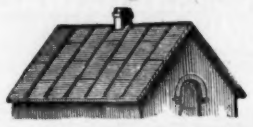

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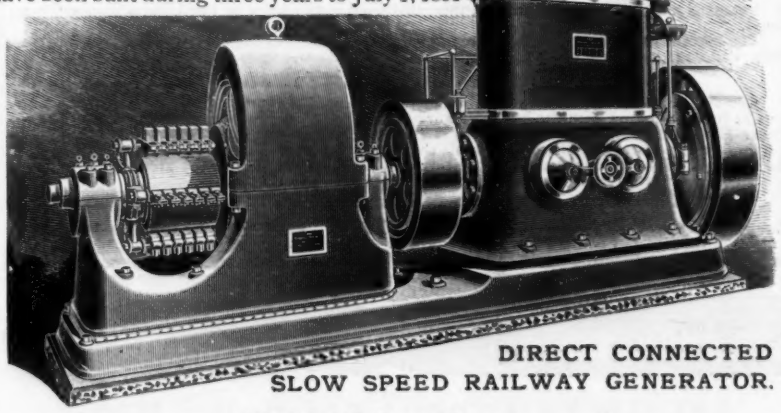

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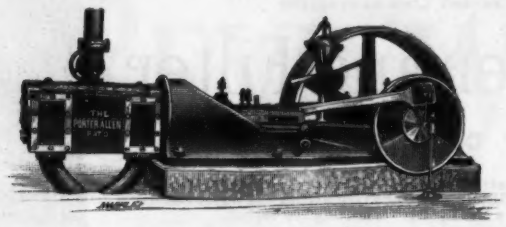

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Diameter of Tubes	3 in.	Diameter of Tubes	3 in.
Length of Tubes	8 ft.	Length of Tubes	8 ft.
Number of Tubes	36	Numbes of Tubes	42
Fire Box, Height	36 in.	Smoke Box	18 in.
Width	36 in.	Fire Box Height	39 in.
Length	48 in.	Width	38 in.
Dome, Diameter	28 in.	Length	52 in.
Height	34 in.	Dome, Diameter	30 in.
		Height	34 in.

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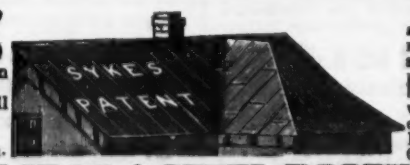

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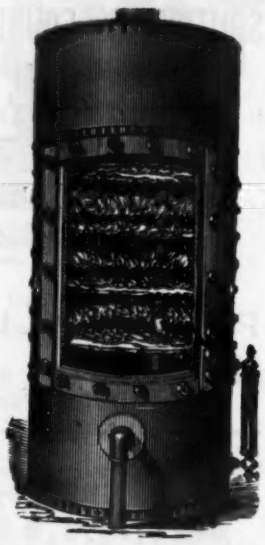

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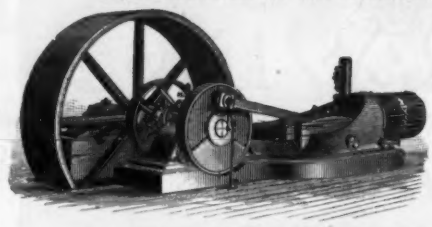

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